BACTERIOLOGICAL AND MYCOLOGICAL PROFILE OF OCULAR INFECTIONS

Dissertation submitted in

Partial fulfillment of the Regulations required for the award of

M.D. DEGREE

In

MICROBIOLOGY– BRANCH IV

The Tamil Nadu

DR. M.G.R. MEDICAL UNIVERSITY

Chennai

APRIL 2015.

CERTIFICATE

This is to certify that the enclosed work **"BACTERIOLOGICAL AND MYCOLOGICAL PROFILE OF OCULAR INFECTIONS"** submitted by **Dr. S.K. Sathiya Priya** to The Tamilnadu Dr. MGR Medical University is based on bonafide cases studied and analysed by the candidate in the Department of Microbiology, Coimbatore Medical College Hospital during the period from August 2013 to July 2014. Under the guidance and supervision of **Dr. V. Sadhiqua, DGO, M.D,** Associate Professor in the Department of Microbiology and the conclusion reached in this study are her own.

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DECLARATION

I, **Dr. S.K. Sathiya Priya** solemnly declare that the dissertation entitled **"BACTERIOLOGICAL AND MYCOLOGICAL PROFILE OF OCULAR INFECTIONS"** was done by me at Coimbatore Medical College Hospital, during the period from August 2013 to July 2014 under the guidance and supervision of **Dr. V Sadhiqua, DGO, M.D**., Associate Professor, Department of Microbiology, Coimbatore Medical College, Coimbatore.

This dissertation is submitted to The Tamilnadu Dr. MGR Medical University towards the partial fulfilment of the requirement for the award of M.D. Degree (Branch – IV) in Microbiology.

I have not submitted this dissertation on my previous occasion to any University for the award of any degree.

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The Ethics Committee, Coimbatore Medical College has decided to inform that your Dissertation Proposal is accepted / ~~Not accepted~~ and you are permitted / ~~Not permitted~~ to proceed with the above Study.

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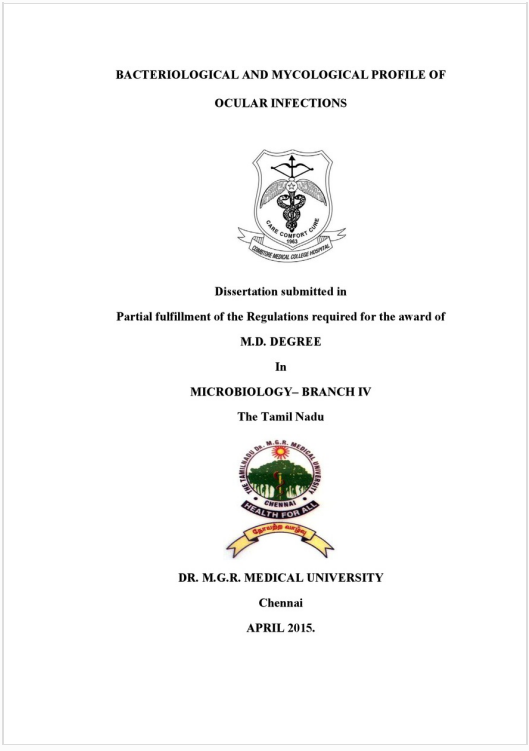

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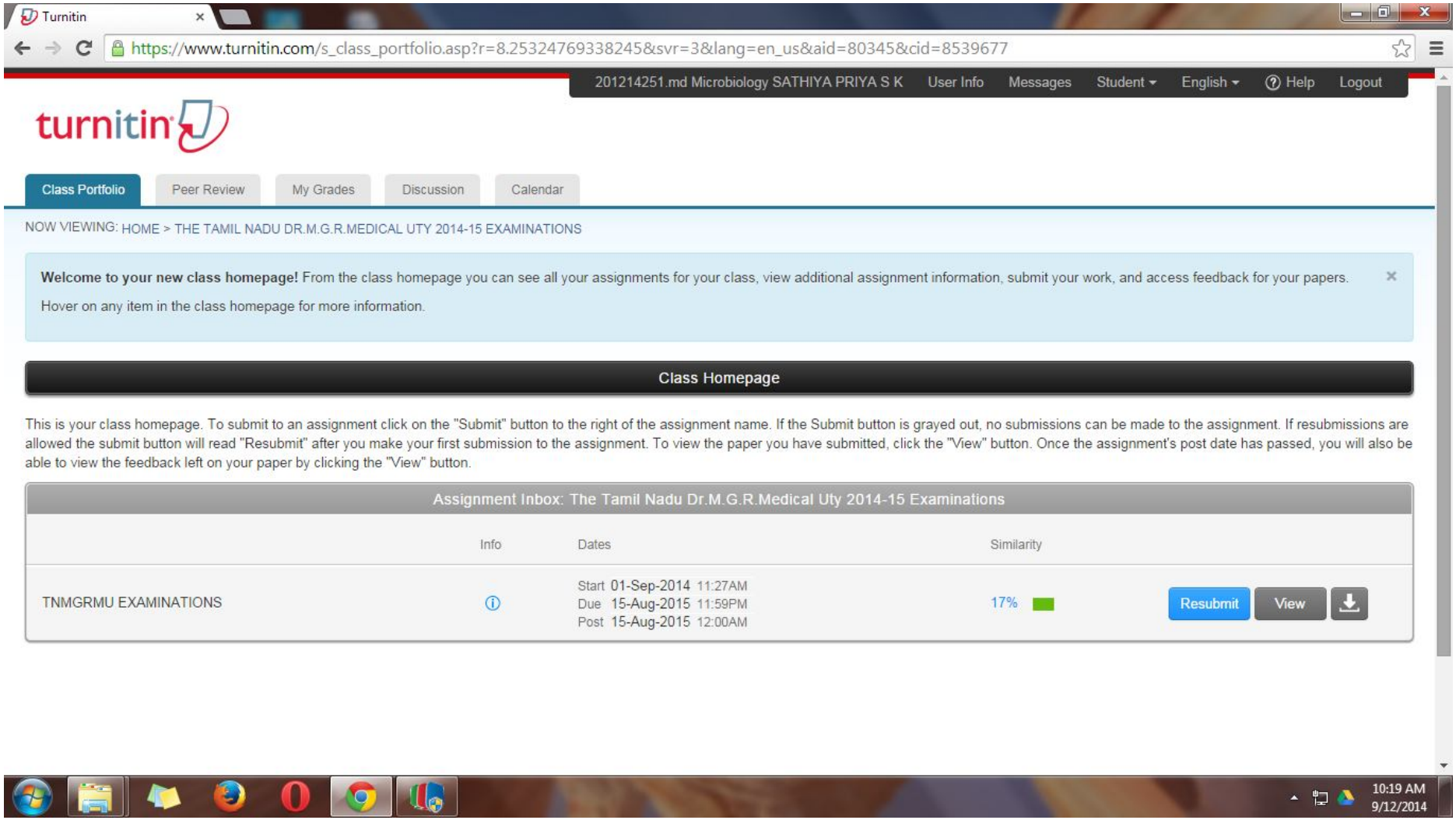
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CONTENTS

BACTERIOLOGICAL AND MYCOLOGICAL PROFILE OF OCULAR INFECTIONS

ABSTRACT

Background:

The eye may be infected from external sources or through intraocular invasion of microorganisms carried by the blood stream. This study was undertaken to isolate and identify the specific bacterial and fungal pathogens causing ocular infections and to determine their antimicrobial susceptibilities of the isolated pathogens.

Materials and Methods:

A prospective analysis of all patients with clinically diagnosed ocular infections such as hordeolum internum, hordeolum externum, chalazion, conjunctivitis, keratitis, Dacryocystitis, endophthalmitis and panophthalmitis presented between August 2013 to July 2014 was performed. Extra ocular and intraocular specimens were collected and subjected to direct microscopy and culture.

Results:

A total of 222 patients with ocular infections were analysed of which conjunctivitis constituted 96 cases, keratitis constituted 30 cases, lacrimal sac infections constituted 53 cases, eyelid infections constituted 37 cases and intraocular infections constituted 6 cases.

In case of conjunctivitis, predominant bacterial species isolated was gram positive cocci 31 (75.6%) of which Staph aureus constituted 21 (67.7%) followed by CoNS 8(25.8%) and Strep pneumoniae 2(6.5%).The gram positive isolates were susceptible to Ciprofloxacin, Ofloxacin, Gentamycin , Vancomycin and Amikacin. The gram negative bacilli isolated isolated were E.coli 7(70%) followed by Klebsiella pneumoniae 3(30%).They were susceptible to Amikacin and Ceftriaxone.

In keratitis cases, fungal keratitis was common and the most common fungi isolated was Fusarium spp. 6(75%) followed by Penicillium spp. 2(25%).The antifungal susceptibility showed most susceptible to Amphotericin B, Voriconazole and Natamycin.

In case of lacrimal sac infections , the gram positive cocci 22(78.6%) was commonly isolated , Out of which Staph aureus 13 (59.1%) was most common followed by CoNS 9(40.9%) .They were most susceptible to Vancomycin, Chloramphenicol, Amoxyclavulanic acid, Gentamycin and Ofloxacin. The gram negative bacilli constituted 6 (21.4%) of which

E.coli 4 (66.7%) was common followed by Klebsiella pneumoniae 2(33.3%)..They were susceptible to Amikacin, Gentamycin and Ceftriaxone.

In case of eyelid infections, gram positive cocci 21 (56.8%) was commonly isolated of which CoNS 12(57.1%) was most common followed by Staph aureus 9(42.9%).They were susceptible to Vancomycin, Ofloxacin, Doxycycline ,Gentamycin and Ciprofloxacin.

Conclusion:

Staphylococcus aureus frequently causes conjunctivitis and lacrimal sac infections and CoNS frequently causes eyelid infections. Of the tested antibiotics, Gentamycin , Vancomycin and fluoroquinolones like Ciprofloxacin and Ofloxacin are good choice for treating ocular infections. Fungal keratitis is most common and Fusarium spp. is most commonly responsible and susceptible to Amphotericin, Voriconazole and Natamycin.

The antimicrobial resistance is increasing among the ocular antibiotics and hence culturing of ocular specimens before starting the therapy is warranted.

Keywords:

Cojunctivitis, Keratitis, Eyelid infections, lacrimal sac infections, ocular infections.

INTRODUCTION

Ocular infections are one of the most commonly encountered infections. Normally, there are various natural defence mechanisms that protect the eye against infections. These include the blink reflex , bioactive components of the tear film consisting of lysozyme, IgA and IgG and the surface epithelium of the cornea.[1]

Infection results when these barriers are disrupted either due to exogenous or endogenous factors which facilitate intraocular invasion of the microorganisms. Infection occurs exogenously either due to penetrating injury to the eye or as a result of intraocular surgery. Infection is acquired endogenously as a result of haematogenous spread of infection from other parts of the body.

The most frequently affected areas of the eye are the conjunctiva, cornea and the eyelids.[2] The common infections of the eye include infections of the lids namely Hordeolum internum, Hordeolum externum and chalazion, dacryocystitis, conjunctivitis, keratitis , endophthalmitis and panophthalmitis.[3]

Eyelid margins harbours a variety of microorganisms and causes infections. These infections are usually localised but sometimes may spread to the adjacent tissues like conjunctiva and cornea.[3] Bacteria are the major causative agents that cause eyelid

infections. The most common organisms involved are Staphylococcus aureus, Streptococcus species, Pneumococcus etc.

Dacryocystitis is inflammation of the lacrimal sac and occurs due to blockage of secretion of the tears. This causes accumulation of secretions and tears within the sac and causes infection. The organisms causing these infections are mainly Staphylococcus aureus and Streptococcus species which usually arise from the conjunctival sac as they are seen as commensals. This is of particular importance since if left untreated it may lead to spread of infections to other parts of the eye.[4]

Conjunctivitis refers to the inflammation of the conjunctiva which is mostly due to bacteria and virus and rarely fungus. The bacterial conjunctivitis is the most common ocular infection which involves all ages and has a worldwide distribution.[5] The conjunctival sac harbours a variety of microorganisms and the bacteria present in it constitutes a constant source of infection to other parts of the eye. Normally, the conjunctiva supports a population of bacteria that does not cause any disease ,but however infections occur when the micro organisms overwhelm local host defence mechanisms.[3] The organisms commonly causing bacterial conjunctivitis are Staphylococcus aureus, Streptococcus species,

Pneumococcus, Haemophilus aegypticus ,etc. Viruses are also an important cause of conjunctivitis and 20% of such infections in children are due to adenoviruses.[5]

Keratitis refers to inflammation of the cornea and the organisms commonly implicated are bacteria and fungi. . Microbial keratitis is a potentially dreadful condition that requires prompt diagnosis and treatment to prevent further complications like endophthalmitis and panophthalmitis.

Bacterial keratitis causes corneal ulceration which lead to corneal opacity and severe visual loss[1] . It is mostly an exogenous infection due to pyogenic organisms like Staphylococcus aureus, Pneumococcus, Pseudomonas aeuroginosa ,Escherichia coli ,etc.

Fungi gain access into the cornea due to a defect in the corneal epithelium and cause tissue necrosis leading to ulceration and subsequently corneal opacity . Mycotic keratitis is common in rural agricultural workers and has an unfavourable prognosis due to its protracted course and constitutes an important cause of blindness[6].

The most common predisposing factors of mycotic keratitis are trauma particularly by vegetative matter, indiscriminate use of topical corticosteroids ,use of contact lens and rarely by retention

of hair in the cornea[6]. It is commonly caused by Aspergillus species, Fusarium, Candida albicans, etc.

Endophthalmitis and panophthalmitis are intra ocular infections which leads to a severe sight threatening condition. In India the incidence rate varies from 1% to 3%[7]. It occurs following a penetrating injury with an infected object, following an intraocular surgery or perforation of corneal ulcer. Organisms causing these infections are mainly bacterial or fungal. Organisms causing bacterial endophthalmitis include Staphylococcus aureus, Staphylococcus epidermidis, Pneumococci, Streptococci species, Pseudomonas, Esherichia coli. The common fungi causing fungal endophthalmitis are Aspergillus, Fusarium, Candida and Penicillium.

If these infections are left untreated it may lead to visual loss. Sometimes these infections spread outside the eyeball leading to orbital cellulitis and meningitis. Hence , appropriate therapy must be initiated to control these infections and thereby reduce the ocular morbidity[3]. For specific treatment, isolation and identification of bacterial pathogens and antibiotic susceptibility pattern is essential[2]. Hence the bacterial aetiology and their antibiotic susceptibility must be updated to make a rational choice of initial antibiotic therapy.

Hence , this study was undertaken to isolate and identify the bacterial and fungal pathogens responsible for the development of ocular infections and to determine their in vitro susceptibilities to commonly used antibiotics

AIMS & OBJECTIVES

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AIMS:

To isolate and identify the bacterial and fungal pathogens causing ocular infections and to determine their antimicrobial susceptibility pattern in patients attending a tertiary care hospital.

OBJECTIVES:

1) To study the demographic characteristics in clinically diagnosed cases of conjunctivitis .
2) To identify the bacterial profile and their antibiotic susceptibility pattern.
3) To determine the epidemiological characteristics and risk factors predisposing to microbial keratitis .
4) To identify the organisms causing keratomycosis and the antifungal susceptibility pattern of the isolated fungal pathogens.
5) To document the microorganisms causing lacrimal sac infections and their antibiotic sensitivity pattern.
6) To present the microbial spectrum and susceptibilities of the isolates in eyelid infections .
7) To evaluate the microbiological profile of intraocular infections and their antibiogram.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

OVERVIEW OF OCULAR INFECTIONS:

Eye may be infected by bacteria, fungi, viruses or parasites. The external ocular surface gains microbial flora at birth and some of these resident flora in the conjunctiva and eyelids have a potential to change into pathogens when the local defence mechanisms of the eye are impaired. Apart from this resident flora, any organism from the environment can gain entrance into ocular tissues and cause infection[11].

The following are the ocular resident flora and their incidence

Organisms	**Incidence(%)**
1) CoNS	34-94
2) Propionibacterium acnes	40-86
3) Corynebacterium spp.	3-83
4) Staph.aureus	0-30
5) Haemophilus influenzae	0-25
6) Micrococcus spp.	2-22
7) Streptococcus pneumoniae	0-5
8) Viridans Streptococci	0-12

9) Gram negative rods (Proteus, Klebsiella,E.coli,Enterobacter spp.) 0-5

10) Beta haemolytic Streptococci 0-3

Among these, CoNS and Corynebacterium spp. constitute 80-90% of the indigenous flora. Staphlyococcus aureus, Streptococcus pneumoniae and H.influenzae can turn into pathogens depending on the age of the patient and geographic location[12].

To differentiate between infection and colonisation, quantitative ocular cultures have been used to establish a threshold. Infection is established when these organisms reach or exceed the threshold number.

HOST IMMUNE STATUS:

The protection of ocular structures are supported partly by a defence system consisting of local and systemic, humoral and cellular mechanisms which join together to prevent microbial invasion

There are several local defence mechanisms that protect the eye against infection. These include

1) Intact epithelium of the eyelids, conjunctiva and cornea.

2) The blink reflex and flushing action of the tears protect the eye from infection by removing the bacteria and debris from the ocular surface.
3) The high concentration of lysozyme, lactoferrin, Ig A and Ig G are present in the tear film that protects the eye from infection.
4) Ig A helps in coating the bacteria and aids in phagocytosis
5) Lysozyme acts as a bacteriostatic.
6) Lactoferrin inhibits the growth of bacteria by competing and binding to iron[12].

ANATOMY OF THE EYE

Eyeball comprises of three layers namely,

1) Outer fibrous layer - sclera and cornea
2) Middle vascular coat -iris, ciliary body ,choroid
3) Inner nervous coat – Retina

The structures present inside the eyeball are

1) Aqueous humour
2) Lens
3) Vitreous humour

The accessory structures of the eye are

1) Eyelids and eyelashes

2) Lacrimal apparatus

The Sclera constitutes the outer two-thirds of the fibrous layer of the eyeball. It maintains the structural integrity of the eyeball. It is covered anteriorly by a translucent mucous membrane, the conjunctiva.

Conjunctiva lines the posterior surface of the eyelids and reflected over the anterior part of the eyeball upto the limbus. The name (conjoin: to join) denotes that it joins the eyeball to the lids.

Cornea is a transparent , avascular, structure that constitutes the anterior one-third of the eyeball.

Uvea is the vascular layer of the eye and consists of three parts namely iris, choroid and ciliary body. Iris is a thin circular disc with a central aperture called pupil that regulates the amount of light that reaches the retina. It divides the space between the cornea and lens into anterior and posterior chamber.

Ciliary body is the forward continuation of the choroid and is involved in aqueous humour secretion .Choroid is a highly vascular layer situated between the sclera and retina.

Retina is the innermost layer of the eyeball and is thin and transparent membrane and is concerned with visual function.

Aqueous humour is a clear , colourless watery solution present in the anterior chamber and helps in the maintenance of intraocular pressure. It also provides nutrition to the cornea.

Vitreous humour is an inert, transparent, jelly like fluid that acts as an important supporting structure of the eyeball.

Eyelids are movable folds of tissue situated in front of the eyeball. The important function of the eyelids helps in spreading the tear film over the cornea and conjunctiva and protects the eyeball from external injury and infection.

The glands of the eyelids are mainly the

1) Meibomian glands:

   These are modified sweat glands and open vertically on the lid margin.

2) Zeis' s gland:

   These are modified sebaceous glands that are attached to the hair follicles.

Lacrimal system:

These are the structures concerned with the secretion of the tears and its transport.

The secretory system consists of the lacrimal gland and accessory lacrimal glands.

The excretory system consists of the

1) Lacrimal puncta
2) Lacrimal canaliculi
3) Lacrimal sac
4) Naso lacrimal duct

Infections of the eye include eyelid infections, lacrimal sac infections, conjunctivitis, keratitis and intraocular infections like endophthalmitis and panophthalmitis.

CONJUNCTIVITIS

The conjunctiva is the exposed part of the eye most frequently prone for infections. It is sterile at birth but later it becomes invaded with various microorganisms[13].

Conjunctivitis is the inflammation of the conjunctiva which is caused by infections, allergens or irritants[14].

Epidemiology:

Conjunctivitis is the most common inflammation of the eye and is seen in all geographic locations. Conjunctivitis is caused by several organisms which include bacteria, viruses, fungi, Chlamydia, protozoa and helminths like Oncochera volvulus, Loa loa[11]. The various types of conjunctivitis share a number of signs and symptoms but there exists some clinical differences which are suggestive of appropriate identification and treatment. The majority of the conjunctival infections are of bacterial or viral origin. Fungal infections are rare[13].

CLASSIFICATION OF CONJUNCTIVITIS

Based on the infective aetiology:

1. Bacterial – Staphylococcus aureus, Staphylococcus epidermidis, Haemophilus aegypticus, H.influenzae, Neissseria gonorrhoeae, Streptococcus pyogenes, Streptococcus pneumonia, Proteus, Klebsiella pneumoniae, Esherichia coli.
2. Viral - Herpessimplex, Picornavirus (Enterovirus 70), Adenovirus, Measles.
3. Chlamydia trachomatis (D-K group)

4. Fungal (Aspergillus,Candida,Actinomyces)
5. Parasitic

Infective conjunctivitis is the most common type of conjunctivitis in the developing countries[15]. Among them, bacterial conjunctivitis is more common. Mostly bacterial conjunctivitis is due to organisms of exogenous source[16].

Aetiology:

The most common bacterial pathogens responsible for conjunctivitis are Staphylococcus spp., Streptococcus pneumoniae, Haemophilus spp., Enteric gram negative rods like E.coli, Pseudomonas, Klebsiella pneumoniae. The organisms varies according to the age of the patient[17].

In a prospective study conducted in Israel ,bacterial conjunctivitis in children is most often caused by H.influenzae and Streptococcus pneumoniae which accounted for 29% and 20% of the cases[18].

Conjunctivitis due to H.influenzae spreads easily in schools and households. It is also associated with systemic infections such as upper respiratory tract infections and its treatment requires administration of systemic antibiotics.

S.pneumoniae is the second most common cause of bacterial conjunctivitis in children and can also cause epidemic outbreaks among young adults.

S.pneumoniae is associated with conjunctivitis-otitis syndrome which accounted for approximately 23% of culture proven cases[19].

The less common causes of bacterial conjunctivitis in children include Moraxella spp.,Staph. aureus and Coagulase Negative Staphylococci.

The most common causes of bacterial conjunctivitis in adults are Staphylococcus aureus and H.influenzae. In the healthy adults , 3.8% to 6.3% of the conjunctivae are colonised by Staphylococcus aureus.

In addition ,normally 20% of the people harbour Staph.aureus continually in the nasal passages and another 60% harbour intermittently. In both these cases, Staph.aureus may act as a reservoir of recurrent ocular infection[20].

Streptococcus pneumoniae, CONS , Moraxella spp., and Acinetobacter spp. are the other organisms that cause conjunctivitis in adults[21].

Predisposing Factors:

The predisposing factors include

1. Constant exposure to airborne fomites.
2. Upper respiratory tract infections
3. Skin flora on hands
4. Genital secretions[22]

Pathogenesis:

Some organisms like Neissseria gonorrhoeae ,Neisseria meningitidis, Streptococcus pneumoniae can penetrate the intact epithelium of the conjunctiva. For other microbes to enter and establish a disease , a breach must occur in the conjunctival epithelium.

Injury to the conjunctival epithelium allows the adhesion of the bacteria which results in the entry of various bacterial products and toxins. Invading bacteria along with the secreted toxins represent foreign antigens which induce antigen antibody immune reaction and subsequently leading to inflammation[23].

The bacterial conjunctivitis is clinically classified into acute, hyperacute or chronic.

ACUTE BACTERIAL CONJUNCTIVITIS:

It is classified into : 1) Acute mucopurulent conjunctivitis

2) Purulent conjunctivitis

3) Membranous conjunctivitis

1) Acute mucopurulent conjunctivitis :

It is caused by organisms such as Staphylococcus aureus, Streptococcus pneumoniae, H.influenzae etc.

Incidence:

1) It causes epidemics and occurs bilaterally.
2) It is a contagious disease and spreads by flies, fingers and fomites.
3) It is usually self limiting.

Symptoms:

1) Redness of the affected eye.
2) Mucopurulent discharge is seen in the fornices of the conjunctiva and in the margins of the lids.
3) Stickiness of the lids due to accumulation of mucous discharge

Signs:

1) Conjunctival congestion is present.

Complications:

1) Keratitis
2) Chronic conjunctivitis

Treatment:

1) Cleanliness of the eyes.
2) Frequent instillation of antibiotic drops and application of antibiotic eye ointment at bedtime.

2) Purulent conjunctivitis:

It is a serious condition and occurs in two forms. In adults it causes acute purulent conjunctivitis. In Children it causes Ophthalmia neonatorum.

1) Acute Purulent conjunctivitis:

It is an acute inflammation of conjunctiva in adults and most cases are caused by Neisseria gonorrhoeae.

Incidence:

1) It commonly occurs in males .
2) There may be an associated infection in the genital area.
3) The incubation period ranges from few hours to 3 days.

Symptoms:

1) Swelling of the lids and conjunctiva is seen.
2) Purulent discharge is seen at lid borders and in the fornices of the conjunctiva.

Signs:

1) Conjunctival congestion is seen.
2) The eye lids are swollen, tense and tender.
3) Preauricular lymphadenopathy may be present.

Treatment :

1) Cleanliness of the affected eyes
2) Topical application of benzyl penicillin eyedrops every minute for half an hour. Later it can be continued 4^{th} hourly for 3 days.
3) If allergic to Penicillin, antibiotics like Ciprofloxacin, Tobramycin, Gentamycin can be instilled.

2) Ophthalmia neonatorum:

It is a preventable disease that occurs in newborn babies. Ophthalmia neonatorum refers to the inflammation of the onjunctiva with discharge manifesting within first 28 days of life. The

infection is acquired by the neonate during passage through the infected maternal vaginal canal.

The pathogens causing neonatal conjunctivitis differs in various parts of the world depending upon relative prevalence of prenatal maternal care and use of prophylactic treatment to prevent infection in the pregnant mother and the newborn infant.

Aetiology:

From maternal genital tract: Neisseria gonorrhoeae, Chlamydia trachomatis, GroupB betahaemolytic streptococci .

From cross infection :

Staph.aureus, Coliforms, Pseudomonas aeuroginosa.

The common causes of ophthalmia neonatorum include Chlamydia trachomatis , Staph aureus, Staph.epidermidis, E.coli, Neisseria gonorrhoeae and other gram negative bacteria[24].

In a study conducted by Chandler et al, 142 pregnant women underwent cervical culture for Chlamydia trachomatis at 36-40 weeks, 12 had positive culture. Their infants were followed in post operative period. Out of them,8(44%) developed ophthalmia neonatorum[25].

Clinical features:

1) The conjunctiva is bright red with outpouring of thick yellow pus.
2) Sticking together of lids is a common feature.

Treatment:

1) Frequent cleaning of the eyes with warm saline.
2) Topical therapy with Benzyl penicillin drops supplemented with parenteral Penicillin.

Prophylaxis:

1) Aseptic precautions should be taken during delivery.
2) Instill Penicillin and broad spectrum antibiotic eyedrops immediately after birth.

3) Membranous conjunctivitis:

Membranous conjunctivitis is an acute inflammation of the conjunctiva characterised by the formation of true membrane on the palpebral conjunctiva. Now a days it is very rare due to markedly decreased incidence of diphtheria.

Aetiology:

Corynebacterium diphtheriae is the most common pathogen and the other organisms responsible are N.gonorrhoeae, S.pneumoniae and Streptococcus spp.

Pathology:

Corynebacterium diphtheriae produces a violent inflammation of the conjunctiva associated with the deposition of fibrinous exudate on the surface as well as in the substance of the conjunctiva resulting in the formation of a membrane.

Clinical features:

1) Most commonly children between 2-8 yrs are affected. The child is toxic and febrile.
    1) There is swelling of lids with mucopurulent discharge.
    2) On everting the lids, a white membrane is seen covering the palpebral conjunctiva.

Treatment:

a) LOCAL

1) Local Penicillin eye drops(1:10000 units/ ml) should be instilled every half hourly.
2) Antidiphtheritic serum should be instilled every one hour.
3) Broad spectrum antibiotic ointment at bedtime.

b) SYSTEMIC:

1) Crystalline Penicillin 5 lakh units intramuscularly twice a day for 10 days.
2) Antidiphtheritic serum (50000 units) intramuscularly stat to be given

c) PROPHYLAXIS:

Proper immunisation against diphtheria is very effective and protects the community.

CHRONIC CONJUNCTIVITIS:

It often occurs as continuation of acute conjunctivitis.

Aetiology:

1) The common causes include irritation by smoke, dust, heat and allergens.
2) Other causes include misdirected eyelashes, dacryocystitis, chronic rhinitis.
3) Seborrhoea and dandruff of the scalp are other associated conditions[26].

Symptoms:

1) There is burning discomfort and grittiness of the eyes.
2) The surface of the conjunctiva looks sticky.

3) Congestion of the conjunctival fornices and the palpebral conjunctiva is seen.
4) Mild serous discharge may be seen.

Treatment:

1) Treat the underlying cause in the lacrimal sac,scalp and the nose.
2) Protective glasses should be used to avoid the irritants.
3) Short course of suitable antibiotic drops and ointment should be given after bacteriological examination.

KERATITIS

HISTORY:

James Wardrop –Introduced the term keratitis in 1988.

Virchow- Introduced the term mycosis for fungal infection.

Leber- Reported the first case of Fungal keratitis in 1879.

Cornea being the anterior part of the eyeball is exposed to the atmosphere and hence gets infected more easily[27]. The cornea is protected from infection by the normal defence mechanisms.

DEFENCE MECHANISMS OF THE CORNEA:

1) The physical barrier of the eyelids to foreign material.
2) The regular blink reflex that clears away debris from the tears.
3) The tight junctions between the conjunctival and corneal epithelial cells.
4) Immune mediators play a role in protection against the corneal surface. These include
    1) conjunctival mast cells
    2) conjunctival associated lymphoid tissue that are responsible for local antigen processing
    3) Immuno active substances in the tear film consisting of Ig A, lysozyme, beta lysine, lactoferrin and tear specific albumin[28].

Corneal infection results when atleast one risk factor compromises these defence mechanisms.

Keratitis is the inflammation of the cornea. It is of clinical importance since they often lead to permanent opacities if left untreated. This lowers the visual acuity and its complications leads to blindness. Keratitis can be classified as follows,

AETIOLOGICAL CLASSIFICATION

A) Superficial

1) Infective Keratitis

-Bacterial

-Viral

- Fungal

2) Non infective Keratitis

1) Central- Exposure Keratitis

- Neurotrophic Keratitis

2) Peripheral- Keratitis associated with collagen vascular diseases

B) Deep Keratitis

-Interstitial Keratitis[29]

In developing countries , infectious keratitis is a leading cause of blindness .The incidence ranges from 11 per 100000 in the United states to 1-299 per 100000 in developing countries[30].

BACTERIAL KERATITIS:

The avascular corneal stroma is more susceptible to bacterial infection and patients have a poor clinical outcome if appropriate therapy is not initiated[31].

Studies have reported that bacterial pathogens are responsible for 65% to 90% of all cases of keratitis[32].

The two main factors in the production of purulent corneal ulcer are damage to the corneal epithelium due to trauma and infection of the eroded area. The causes of damage to the corneal epithelium may be due to the presence of foreign body in the cornea, misdirected eyelash and use of contact lens wear. Sometimes epithelial drying as occurring in xerosis and exposure keratitis also contributes to the problem.

SOURCE OF INFECTION:

The infection is acquired exogenously from the conjunctival sac, lacrimal sac or from infected foreign bodies like vegetative matter. Owing to the anatomical continuity ,infections from the conjunctiva, sclera and uveal tract spreads to the cornea.

PREDISPOSING FACTORS:

1) Trauma to corneal epithelium by foreign body and contact lens wear.
2) Use of topical corticosteroids
3) Exposure keratopathy or xerosis
4) Underlying corneal diseases like keratomalacia and corneal erosions

5) Chronic dacryocystitis

6) Immunosuppressive therapy[33]

In a study conducted by Bourcier et al, 300 cases of presumed bacterial keratitis were studied to identify the predisposing factors.The risk factors were identified in 90.6% of cases. Contact lens wear (50.3%) was the main risk factor. History of keratopathy and Trauma was identified in 21% and 15% of the cases[34].

In a study by Dart JK et al, 53 patients with suspected microbial keratitis were examined to identify the predisposing factors. Among them the principal associations found were pre-existing corneal diseases 22 (41.5%) and contact lens wear 22(41.5%)[35].

The study also identified that gram negative keratitis was more frequent in lens wearers and Pseudomonas aeuroginosa caused keratitis more frequently in soft contact lens wearers.

AETIOLOGY:

Most bacterial keratitis are caused by Staph.spp., Streptococcus pneumoniae ,Proteus, Serratia, Klebsiella sp,

Enterobacter, Citrobacter, Pseudomonas aeuroginosa, Haemophilus and Moraxella.

Organisms responsible for bacterial keratitis are changing over many years. In the past Strep.pneumoniae was the most common organism responsible but now Pseudomonas and anaerobes are increasingly reported.

Among the gram positive organisms, Staphylococcus aureus is the most common organism responsible for bacterial keratitis. Staph. epidermidis along with Streptococcus spp. causes keratitis in the immunodeficient individuals . It may be associated with chronic dacryocystitis.

In a study by Schaefer et al on bacterial keratitis, 85 patients with suspected keratitis were studied and the commonly isolated bacteria were Staph.epidermidis 40%, Staph.aureus 22%, Strept.pneumoniae 8%, other streptococcus spp.5%, Pseudomonas 9%, Moraxella 5%, Serratia 5%, Bacillus, Corynebacterium, Alkaligenes, Morganella, Haemophilus influenzae 1% each[36].

Normally, gram positive aerobic bacilli do not cause keratitis in the immunocompetent individuals but Corynebacterium diphtheriae has been reported to invade the intact epithelium of the cornea.

Pseudomonas is a virulent organism and is the most common gram negative organism causing bacterial keratitis. If this Pseudomonas infection is left untreated it progresses rapidly to cause corneal perforation.

In chronic contact lens users, Serratia marcescens have been implicated as a cause of keratitis.

Moraxella catarrhalis causes keratitis in patients with chronic ocular surface diseases. Neisseria gonorrhoeae can penetrate the intact corneal epithelium and cause purulent keratitis. Acinetobacter produces keratitis that is clinically indistinguishable from Neisseria.

Symptoms:

1) Pain in the affected eye.
2) Dimness of vision

Signs:

1) Redness of the eyes
2) Corneal opacification is seen
3) Hypopyon or pus in the anterior chamber may be seen.

LAB DIAGNOSIS:

Corneal scrapings are taken from the base of the ulcer . Smear is prepared and Gram staining is done for presumptive identification of the organism.

Scrapings are inoculated onto Blood agar plate, Mac conkey agar plate and chocolate agar plate. Antibiotic sensitivity testing is performed for the isolated organisms.

TREATMENT:

1) Predisposing factors should be identified and treated.
2) Broad spectrum antibiotics
    1) Topical antibiotic drops are instilled at half hourly in initial stages.
    2) Now a days fortified preparations are preferred. Fortified gentamycin drops can be prepared and used.
    3) Antibiotic eye ointment can be applied at night.
    4) Subconjunctival injection of gentamycin should also be given in moderate to severe cases.
    5) Systemic antibiotics are usually required in severe cases.
3) Therapeutic keratoplasty is done to enhance healing and to prevent perforation.

MYCOTIC KERATITIS

Fungal infections of the eye are increasingly recognised as an important cause of corneal blindness .Fungi are significant pathogens causing ocular infections and they lead to devastating consequences if these infections are not accurately diagnosed at an early stage. Fungi are the commonest aetiological agents that constitute 30-40 % of keratitis and it varies by geographic area[30].

Keratomycosis is a fungal infection of the cornea caused by a variety of fungal species. Most of them are saprophytic and are rarely associated with true infections among healthy individuals[37].

EPIDEMIOLOGY:

Fungi are responsible for 6-53% of corneal infections particularly in the tropical countries. Mycotic keratitis is infrequent in developed countries but it constitutes a large proportion of cases in developing countries like India. The causative agents and the clinical frequency are influenced by the geographic area.

Risk factors:

1) Trauma by vegetative matter is the most frequent predisposing factor for fungal keratitis. It constitutes 44-55% of the reported cases .
2) Contact lens use
3) Topical corticosteroid use.
4) Post refractive keratectomy , LASIK and Keratoplasty on a rare occasion can cause fungal keratitis.
5) Foreign body in the cornea
6) Immunosuppressive diseases[28]

AGE:

More common in the middle age 40-50 yrs

SEX:

Males are more commonly affected than Females due to outdoor activities.

SEASONAL VARIATION:

Peak months of the disease corresponds to the harvesting season.(June, September and November)[38]

STUDIES ON FUNGAL KERATITIS:

1) In a study conducted by Rumpa Saha et al, 346 patients of corneal ulcer were investigated and in 77 cases(22.25%), fungal aetiology was identified. Males were more commonly affected than females.They were mostly in the age group of 31-40 yrs[6].
2) In a study conducted at Hospital Universiti Sains Malaysia by Fadzillah et al, Out of 47 patients treated for fungal keratitis ,the most common predisposing factors identified were trauma to the eye 23(48.94%), followed by use of topical steroids 8(17.02%) and pre-existing ocular disease 5(10.64%)[39].

AETIOLOGY

It is difficult to establish between true ophthalmic pathogens and organisms from the environment that are introduced inadvertently during specimen collection.

There appears to be variations in the Genera and species of fungi causing oculomycosis depending on the geographic location.

There are three groups of fungi causing keratomycosis

1) Hyaline filamentous fungi

2) Dematiaceous fungi

3) Yeast and Yeast like fungi

1) HYALINE FILAMENTOUS FUNGI

Filamentous fungi are responsible for two third of all cases of infectious keratitis. Filamentous fungi are the principal cause of mycotic keratitis in most parts of the world. One third of all traumatic infectious keratitis are caused by Aspergillus and Fusarium.

In India , Aspergillus is the common agent causing keratitis followed by other genera.

In a study by Jagdish Chander et al, a total of 154 suspected patients of keratomycosis was studied and fungal aetiology was identified in 64 cases. Most common fungal isolates were Aspergillus species 14(41.18%), Fusarium spp. 8(23.53%), Candida spp. 3(8.82%), Curvularia 2(5.88%), and Bipolaris spp. 2(5.88%)[38].

Filamentous Keratitis is most commonly seen in young men engaged in outdoor activities.

Trauma with vegetable matter, mud ,hay and paddy grain are reported as risk factors for filamentous mycotic keratitis.

Fusarium spp. are frequently encountered as a aetiologic agents mainly in tropical and subtropical regions[28].

In a study by M Srinivasan et al ,434 cases were evaluated for central ulceration and corneal cultures were positive in 297 patients.139 showed pure fungal cultures.The most common fungal isolates were Fusarium spp. representing 47.1% followed by Aspergillus spp.(16.1 %)[40].

Contact lens wearers are at a higher risk for Keratitis. In a recent study , Fusarium keratitis have occurred in contact lens users using contaminated lens solutions or home made solutions.

2) DEMATIACEOUS FUNGI (PHAEIOD FUNGI))

Dematiaceous fungi are responsible for 10-15% of all fungal keratitis .The phaeiod fungi are considered as a significant cause of fungal keratitis and it is the third most commonly encountered fungi following Aspergillus and Fusarium.

These include
1) Curvularia
2) Exophiala
3) Exserohilum
4) Phialophora
5) Scedosporium

3) YEAST AND YEAST LIKE FUNGI:

The majority of yeast in corneal infections are due to Candida spp. predominantly Candida albicans and Candida

parapsilosis[41] .Candida spp. leads to keratitis in patients on long term use of corticosteroids.

PATHOGENESIS:

Fungi gain access into corneal stroma through a defect in the corneal epithelium, multiply and cause inflammatory reaction and tissue necrosis.The epithelial defect usually results from trauma to the eye.

Organisms can penetrate the intact Descemets membrane and gain access into anterior chamber and posterior chamber. Mycotic toxins and proteolytic enzymes augments the tissue damage. The common pathogen that invades a pre existing epithelial defect is Candida. In post traumatic infection, Filamentous fungi are a common cause.

The intrinsic virulence of fungi depends on the fungal substance produced and the host response generated. Filamentous fungi proliferates within corneal stroma with out release of chemotactic substances thereby delaying the host immune response.

Candida albicans produce phospholipaseA2 facilitating the entrance into tissues.

Fusarium solani is able to spread within corneal stroma and penetrate into Descemets membrane with the help of cytotoxins .Fusarium poses a therapeutic challenge since it is more aggressive and less responsive to treatment. The phaeiod fungi are of low virulence and produce protracted lesions.

SIGNS:

1) Dry looking corneal ulcer with delicate ,feathery, finger like hyphal edges protruding into corneal stroma is seen.
2) Massive, immobile hypopyon is seen.

LAB DIAGNOSIS:

The specimen of choice is corneal scrapings. The corneal scrapings are subjected to

1) DIRECT EXAMINATION:

a) 10% KOH MOUNT:

- Demonstrates yeast cells and hyphae
- Septate hyphae are easily seen in KOH mount

b) GRAM STAIN:

It is more useful in identification of yeast cells.

2) CULTURE:

Two sets of SDA with antibiotics are inoculated ,one at 25° c and the other at 37°c. All cultures are examined everyday during the first week and twice a week during next three weeks.

IDENTIFICATION:

The mycelial isolates are identified by the colony characteristics and microscopic morphology by LPCB mount and finally by slide cultures. The yeast are identified by using tests like germ tube test, Chlamydospore formation on cornmeal agar, urease test etc.

SABOURAUD S AGAR:

1) FUSARIUM

Macroscopic appearance:

Obverse: Colonies are pluffy to cottony owing to extensive mycelium.

Reverse: Sometimes, diffusible pigment is seen.

Microscopic appearance:(LPCB Mount)

Conidiophores are single or grouped. Conidia are produced singly or in conidial balls, hyaline and unicellular or transversely

septate. Microconidia are single and often found in chains. Macroconidia are cylindrical but more often crescent shaped.

2) PENICILLIUM:

Miroscopic appearance (LPCB mount)

Conidiophores arise in various forms producing phialides singly or in groups or from branched metulae giving brush like appearance.

Conidia are unicellular and found in chains with the youngest conidia at the base.

3) CANDIDA:

Macroscopic appearance: Cream coloured ,smooth and pasty colonies.

Microscopic appearance: Presence of yeast cells and pseudohyphae can be seen in Gram staining.

TREATMENT:

Topical antifungals are the main stay of treatment.

1) Filamentous Fungi:

First choice: 5% Natamycin ointment

Second choice: Amphotericin B 0.5%

eyedrops & Flucytosine

2) Yeast like Fungi:

First choice: Amphotericin B 0.15% drops

Second choice: Fluconazole 0.5% drops[42].

There is an increasing number of non responding ocular fungal infection which needs necessity for anti fungal susceptibility testing. There are a number of methods for anti fungal susceptibility testing that include CLSI broth based methodology (M 27-A),CLSI Methodology for moulds, E-test agar based testing methods and flow cytometry.

For management of patients not responding to medical treatment Penetrating keratoplasty or Lamellar keratectomy is done.

LACRIMAL SAC INFECTIONS

Dacryocystitis refers to the inflammation of the lacrimal sac as a result of infection.

It has characteristic signs and symptoms which helps in the diagnosis but the progression of the disease is slow and it has a tendency to recur. Moreover it is associated with sequelae leading to recurrent conjunctivitis, orbital cellulitis and endophthalmitis in patients who undergo intraocular surgery.

Under normal circumstances, mucosa of the lacrimal sac is highly resistant to infections but however infections may develop when trigerred by functional problems .

The main mechanism for the development of dacryocystitis is the distal obstruction of the nasolacrimal duct leading to the retention of the tears and development of infection.

It may be of two types acute or chronic

Acute Dacryocystitis

It is an acute inflammation of the lacrimal sac secondary to nasolacrimal duct obstruction. The obstruction of the duct may be due to idiopathic inflammatory stenosis or may be secondary to trauma, infections, inflammation, neoplasm, or due to mechanical obstruction[43].

Obstruction of the nasolacrimal duct leads to the stagnation of tears in the lacrimal system leading to dacryocystitis.

Aetiology:

It is more common in adult women.

It may occur as an exacerbation of chronic dacryocystitis or it may start spontaneously.

It is caused by pyogenic organisms like Staphylococcus spp., Streptococcus spp.,etc. Gram negative isolates accounted for 25% of the isolates with E.coli being most frequently isolated[44].

In a study on acute dacryocystitis in Universiti Sains Malaysia, 23 patients with Dacryocystitis were studied and Females (17) outnumbered males (6).Majority of the isolates were Gram positive bacteria 10(43.4%) followed by Gram negative bacteria 2(12.9%).

Most common organisms were Streptococcus pneumoniae (21.7%) followed by Staphylococcus epidermidis(13%)[45].

Symptoms:

1) Excessive watering from the eyes
2) Redness and tenderness over the lacrimal sac region.

Signs:

1) Swelling and tenderness over the lacrimal sac area.

Treatment:

1) Oral antibiotics
2) I.v antibiotics
3) In case of lacrimal abscess ,incision and drainage can be done.

Chronic Dacryocystitis:

It is a chronic suppurative inflammation of the lacrimal sac. It is a constant threat to cornea and orbital soft tissue[46]. It is more common than acute dacryocystitis.

Types:

There are three types namely catarrhal, mucocele, suppurative

1) Catarrhal - There is intermittent epiphora with mucoid discharge is seen.
2) Mucocele - There is swelling at the lacrimal sac area and regurgitation of pus from it.
3) Suppurative - Due to pyogenic infection lacrimal abscess results.There is reflux of purulent material with pressure and the microorganisms can be isolated.

Incidence :

It is more common in females over 40 yrs of age.

Aetiology:

Mixed bacterial isolates are common with preponderance of Streptococcus pneumoniae and Staphylococcus spp. Staph.aureus and Staph.epidermidis constitutes 45% and 24% of culture proven cases[44].

Fungal infections are reported to present 4% to 7% ,the most common isolated being Candida, although Aspergillus and Mucor can also be found.

In a study by Prakash et al on Dacryocystitis, 80 cases were studied over a period of one year,chronic dacryocystitis was most common when compared to acute and congenital dacryocystitis.The organisms isolated were Staph.aureus (26), Streptococcus pneumoniae(22) ,Pseudomonas(14)[47].

In a study, 44 patients with chronic dacryocystitis were evaluated and the gram positive bacteria isolated was CoNS (71%), and Staph.aureus (14%)[48].

Treatment:

1) Dacryocystectomy in elderly individuals.
2) Dacryocystorhinostomy in young and adult patients.

ENDOPHTHALMITIS

Endophthalmitis is the inflammation of intraocular tissues or cavities as a result of complication of any ocular surgery, contiguous spread from infected tissues of the cornea and uveal

tissue, use of contaminated medications or penetrating ocular trauma[49] .

Depending on infectious agents, two categories are recognised

1) Bacterial endophthalmitis
2) Fungal endophthalmitis

The predominant organism depends on the normal conjunctival flora and associated adnexal infection. In many cases of endophthalmitis, an aetiological agent may not be detected on laboratory cultures[50].

POST OPERATIVE ENDOPHTHALMITIS:

It occurs as a complication following any intraocular surgery. Blindness secondary to post-operative endophthalmitis has been reported upto 18% of the patients[50] .

Bacterial Endophthalmitis:

The gram positive organisms are responsible for 90% to 95% of post surgical endophthalmitis.

The gram positive organisms causing endophthalmitis are Staph.aureus, Staph.epidermidis, Pneumococcus, Streptococcus

viridians, Streptococcus pyogenes and Corynebacterium. Of these the predominant isolate is Staph.epidermidis in 20% to 50% the cases.

Although it is caused by Staph. epidermidis, poor visual outcomes are associated with Staph.aureus, Streptococci, Enterococci and gram negative organisms.

In a study on bacterial endophthalmitis, a total of 100 microorganisms were isolated. Among them 91% were gram positive bacteria and 9% were gram negative bacteria. CoNS (48%) was frequently isolated followed by Streptococcus viridians(18%) , and Staph.aureus (13%)[51].

The Gram negative isolates constitutes only 6%. Pseudomonas aeuroginosa is the most common among them. Other organisms that cause postoperative endophthalmitis are Proteus mirabilis, Klebsiella pneumoniae, H.influenzae, E.coli and Enterococci.

In a study on postoperative endophthalmitis, among 170 cases of culture proven postoperative endophthalmitis,71(41.7%) were attributed to Gram negative bacteria, 64 (37.6%) to Gram positive bacteria and 37 (21.8%) were due to Fungi[52].

Fungal endophthalmitis:

The organisms causing fungal endophthalmitis are Aspergillus, Candida, Cephalosporium, Penicillium and Paecilomyces .

Fungal endophthalmitis is of two types

1) Exogenous endophthalmitis
2) Endogenous endophthalmitis

1) Exogenous endophthalmitis:

It occurs due to introduction of organisms into the eye from outside. There is no underlying immunodeficiency. Although Candida is the commonest cause , other agents include Aspergillus, Fusarium,Paecilomyces, Curvularia etc. The first case of exogenous Aspergillus endophthalmitis was reported in 1898 in Heidelberg. Exogenous Aspergillus endophthalmitis usually follows ocular surgery or trauma to the eye.

2) Endogenous Endophthalmitis:

It arises due to haematogenous spread from a focus of infection elsewhere in the body. There is an underlying predisposing condition and the patient is generally immunocompromised. Candida spp. most commonly causes endogenous endophthalmitis in patients with chronic diseases such as Diabetes mellitus and renal insufficiency[53].

Aspergillus is the commonest fungus causing endogenous endophthalmitis in organ transplant patients.

Endogenous endophthalmitis may arise due to i.v drug abusers, immunosuppression associated with organ transplants.

Several species of Aspergillus particularly by Aspergillus fumigatus and Aspergillus flavus are responsible.

Aspergillus spp. are less frequent cause of exogenous or endogenous endophthalmitis than Candida spp.

Endophthalmitis is also classified into acute and chronic.

Acute endophthalmitis:

It develops between 5-7 days after post operative ocular surgery .Most commonly it is caused by Staph.epidermidis or Coagulase negative staphylococci and rarely by fungi.

Delayed endophthalmitis:

It develops one to several months after surgery and the organisms involved are Staph. aureus, Propionibacterium acnes and fungus.

Clinical features:

Bacterial Endophthalmitis:

1) There is sudden onset of severe pain and redness in the affected eye.
2) Dimness of vision is seen.
3) Lid edema ,conjunctival chemosis and cornel haze are present.

4) 4) Hypopyon or fibrous exudate is seen in the anterior chamber.

5) There is associated vitritis and haze in the vitreous.

Fungal endophthalmitis:

1) It has an incubation period of several weeks.

2) Mild pain and redness is seen

3) Thick organised hypopyon is seen

4) The whole vitreous turns into a granulation mass.

Diagnosis:

Culture and sensitivity of the organism from the aqueous and vitreous tap confirms the diagnosis of endophthalmitis.

Treatment of Bacterial endophthalmitis:

1) Intravitreal Antibiotics

- Amikacin,Vancomycin,Ceftazidime
- Ceftazidime is safe in cases of exogenous endophthalmitis.

Generally ,a combination of Vancomycin and Ceftazidime is used as an initial therapy.

2) Topical antibiotics

3) Subconjunctival antibiotics

4) Systemic antibiotics

TREATMENT OF FUNGAL ENDOPHTHALMITIS:

Candida:

- Vitrectomy and intravitreal Amphotericin

Amphotericin is very effective against ocular Candidiasis.

Aspergillus and Fusarium:

- Vitrectomy , intravitreal Voriconazole ,Topical Voriconazole and Systemic Voriconazole is useful.
- Oral Voriconazole penetrates effectively into the cornea.

PANOPHTHALMITIS:

Panophthalmitis is the purulent inflammation of all the layers of the eyeball.

Aetiology : It is of two types namely

1) Exogenous
2) Endogenous

Exogenous:

It is usually due to an operative procedure in the eye or after corneal perforation.

The organisms responsible are Staphylococcus spp., Streptococcus spp., E.coli, Pseudomonas pyocyanea, Clostridium welchii etc.

Endogenous:

It is due to metastatis of the infected embolus in the retinal artery and the choroid vessels.

Clinical features:

1) Severe pain and limited ocular movements of the eye is seen.
2) Corneal wound appears to be necrotic and hypopyon is present.

Treatment:

Medical treatment: **1)**Control of the infection by administration of broad spectrum antibiotics is helpful.

Surgical treatment:

1) Vitrectomy is done in early cases.
2) Evisceration of the eye is done in severe cases.

EYELID INFECTIONS:

Eyelid infections comprises of blepharitis, hordeolum externum, hordeolum internum and chalazion

1) HORDEOLUM EXTERNUM:

It is an acute suppurative inflammation of the Zeis glands.

Aetiology:

It is more common in children, young adults and in patients with eye strain due to refractive errors.

Habitual rubbing of the eyes , Chronic blepharitis and Diabetes mellitus are common causes for the recurrent styes. It is most commonly caused by Staphylococcus spp.

Metabolic factors, excessive intake of alcohol are the other predisposing factors.

In a study by Ramesh et al, out of 55 cases of hordeolum, Staph.aureus was isolated in 32 cases ,CONS in 12 cases, Strep.pneumoniae in 8 cases, Strep.pyogenes in 10 cases and Corynebacterium sp. in 3 cases[3].

Symptoms:

1) Pain and tenderness in the affected eyelid.
2) Watering of the eyes is seen.

Signs:

1) Stage of cellulitis is characterised by localised, hard and tender swelling at the lid margin associated with marked edema.
2) Stage of abscess formation is characterised by the visible pus point on the lid margin.

Treatment:

1) Hot fomentation applied frequently in the early stage is helpful.
2) When pus point is present it is evacuated by epilating the involved eyelid.
3) Antibiotic drops and ointment are helpful.
4) Analgesics and anti inflammatory drugs are used to relieve the pain.

2)CHALAZION

Chalazion is a chronic granulamatous inflammation of the Meibomian gland. It is more common in adults than in children.

Pathogenesis:

Usually , there occurs mild grade infection of the Meibomian glands by organisms of low virulence. As a result there occurs proliferation of the epithelium and infilteration of the walls of the duct that are blocked. Consequently, there is retention of the secretions in the gland causing enlargement.

Clinical features:

1) A small, firm to hard , non tender swelling in the lid .
2) There are no signs of inflammation.

Treatment:

1. Hot fomentation is helpful in early cases.
2. Intralesional steroids helps in resolution of 50% of the cases.
3. Incision and Curettage of the swelling is helpful in refractory cases.

3)HORDEOLUM INTERNUM

It is an acute suppurative inflammation of the Meibomian gland.

Aetiology:

It occurs due to secondary infection of chalazion. It is less common than hordeolum externum..Staph. sp. is the most common organism responsible .

In a study by Parima et al, on identification of hordeolum pathogens, the most common organisms isolated was Staph. epidermidis(35.2%), Staph.aureus (18.5%) and Corynebacterium sp[54].

Symptoms:

1) Pain in the affected eyelid.
2) On everting the lid, pus point is seen.

Treatment:

1) Hot fomentation.

2) Oral antibiotics is helpful.

4) BLEPHARITIS

Blepharitis is the chronic inflammation of the eyelid margins. It usually begins in the childhood and continues throughout the life[55].

Blepharitis affects the lid margins, the lash follicles, in the openings of the Meibomian glands either as an acute or chronic form.

Classification:

1) Anterior blepharitis

2) Posterior blepharitis.

1) Anterior blepharitis:

It may occur in two forms squamous blepharitis and ulcerative blepharitis.

In squamous blepharitis, white scales accumulate along the eyelashes . It is associated with the dandruff of the scalp.

Treatment involves cleanliness of the eyelid margins and antibiotics.

In Staphylococcal blepharitis, yellow crusts are seen glueing the eyelashes. It is an infective condition commonly due to staphylococcal spp.

Treatment involves cleaning of the eyelid margins and topical antibiotic drops.

In a study by Neran et al ,31 eyelid swabs were analysed and Staph.aureus (15) was the commonest bacteria isolated followed by Staph.epidermidis(7) and Strep.pneumoniae(4)[56].

In a study by Udo et al, the most common organism isolated was Staph .aureus (45.5%), Staph.albus (22.7%) Strep.pyogenes (13.6%) Strep.viridans (2.3%) and Klebsiella pneumoniae (6.8%)[57].

2) Posterior blepharitis:

It occurs secondarily to Meibomian gland dysfunction.

The patient presents with the diffuse rounded posterior lid margin.

Treatment is by warm compresses and lid massage together with doxycycline for 6 weeks.

MATERIALS & METHODS

MATERIALS AND METHODS:

This study, "Bacteriological and Mycological Profile of Ocular Infections" was a prospective study conducted in the Department of Microbiology at Coimbatore Medical College Hospital, Coimbatore .

The ethical committee clearance was obtained prior to the start of the study. Informed oral consent was obtained from all cases enrolled in the study.

Study Period:

August 2013 to July 2014

Study group:

Total number of cases studied: 222

Inclusion Criteria:

All patients clinically diagnosed with ocular infections, who attended the Ophthalmology outpatient department at Coimbatore Medical College Hospital, Coimbatore, irrespective of age and sex.

Exclusion Criteria:

1. Patients suffering from Allergic conjunctivitis , Trachoma and Viral conjunctivitis were not included in the study.
2. Patients on prior antibiotic therapy within seven days .

3. Patients with severe ocular trauma.

Study of the selected cases:

The selected cases were studied as per the proforma enclosed. General information like name, age, sex, occupation and address were recorded.

History of predisposing factors like trauma to the eye, use of topical steroids ,use of contact lens, Diabetes mellitus were also recorded.

SPECIMEN COLLECTION:

Ocular infections included were eyelid infections such as blepharitis, hordeolum externum, hordeolum internum and chalazion, lacrimal sac infections comprising of dacryocystitis, mucocele of the lacrimal sac and lacrimal abscess, conjunctivitis, keratitis and intraocular infections such as endophthalmitis and panophthalmitis.

All the patients included in the study were examined by using slit lamp and the infections were diagnosed by the ophthalmologist using standard protocols. After detailed ocular examinations using standard techniques, specimens for smear and culture was obtained.

In case of blepharitis ,specimen was obtained by swabbing the eyelid margin using a broth moistened sterile cotton swab . In case of hordeolum externum, hordeolum internum and chalazion, the abscess were incised and swabs were taken.

In case of lacrimal sac infections, pressure was applied over the lacrimal sac region and purulent material was collected from the punctum. Sometimes surgically excised lacrimal sac was also collected.

In case of conjunctivitis, a sterile cotton swab moistened with Brain heart infusion broth was used to collect the specimen. Patient was asked to look up and a moistened sterile cotton swab was wiped against the lower conjunctival sac of the affected eye from the nasal margin to the temporal margin and back again. In all the above infections, two swabs were taken.

Transport of specimens:

Collected specimens were placed individually in two sterile dry test tubes and transported to the laboratory immediately.

PROCESSING OF THE SPECIMENS:

a) Direct microscopy:

A clean grease free slide was taken and the swabs obtained were smeared on the slide. The slide was air dried and heat fixed. Gram staining was performed for the received samples and examined under microscope for the presence of pus cells and the organisms.

b)Culture:

Specimens obtained were inoculated onto the Blood agar plate, Mac conkey agar plate, chocolate agar plate and incubated aerobically for 18-24 hrs. and then observed the next day. The specimens were also inoculated onto Sabouraud's dextrose agar in duplicates, one incubated at room temperature and the other at 37 $^{\circ}$C. SDA slopes were examined daily for the first week and twice weekly for the next three weeks.

For bacterial identification, colony characteristics were identified by observing the plates ,gram staining done and appropriate biochemical reactions were performed. The commonly performed biochemical reactions were Catalase test, Coagulase test,

Motility test, Indole test, Citrate utilisation test, Urea Hydrolysis test, and sugar fermentation tests.

For the isolated organisms, antibiotic susceptibility testing was done by using Kirby-Bauer disc diffusion method .

Kirby Bauer Disc Diffusion Method:

Inoculum Preparation:

Four to five colonies were selected from the agar plate and with the help of a bacteriological loop the colonies were inoculated into peptone water and incubated for 4 to 5 hrs to achieve turbidity[8]. This was matched with 0.5 Mc Farland standard.

Preparation of 0.5 Mc Farland standard:

This is prepared by adding 0.5 ml of 1% anhydrous $BaCl_2$ to 99.5 ml of 1% H2SO4 in a test tube. This is sealed and kept in the refrigerator.

Inoculation and Incubation:

The Mueller Hinton agar surface was streaked using a sterile swab that has been submerged in the bacterial suspension. The surface of the plate was swabbed in three directions to ensure even distribution of the inoculum over the entire plate.

Within 15 minutes of inoculation, the antibiotic discs were placed and the plates were incubated at 35* C for 24 hrs.

After overnight incubation, the degree of sensitivity was determined by measuring the zones of inhibition of growth around the disc.The results were interpreted by using CLSI guidelines[9]. Commercially prepared antibiotic discs were used and procured from Hi Media Diagnostics.

ANTIMICROBIALS WITH INTERPRETATION OF ZONE SIZE

Antibiotic discs	Disc content (mcg)	Resistant (mm or less)	Intermediate (mm)	Sensitive (mm or more)
Amikacin	30	14	15-16	17
Gentamycin	10	12	13-14	15
Ciprofloxacin	5	15	16-20	21
Ofloxacin	5	12	13-15	16
Doxycycline	30	12	13-15	16
Erythromycin	15	13	14-22	23
Vancomycin	30	-	-	15
Ceftriaxone	30	13	14-20	21
Chloramphenicol	30	12	13-17	18
Cotrimoxazole	25	10	11-15	16

The antibacterial agents used were Amikacin, Gentamycin, Ciprofloxacin, Ofloxacin, Chloramphenicol, Cetriaxone, Doxycycline, Erythromycin, Vancomycin, Cotrimoxazole and Amoxy clavulanic acid.

In case of Keratitis, Corneal scrapings were obtained and bed side inoculation was done onto Blood agar plate, Mac conkey agar plate and chocolate agar plate incubated at 37° c for 18-24 hrs.

The plates were observed the next day to note the colony morphology.

For isolation of fungi, the corneal scrapings were inoculated onto Sabourauds dextrose agar with antibiotics in duplicates ,one kept at room temperature and the other at 37* C. SDA slopes were observed daily for the first week and then twice weekly for the next three weeks. Direct microscopic examination including 10% KOH mount and Gram stain was performed for all the received specimens.

1**) DIRECT MICROSCOPIC EXAMINATION**:

a**) Gram stain:**

Gram stain was done to note the presence of pus cells and the microorganisms.

b) 10%KOH mount :

Principle: Pottasium hydroxide is a strong alkali that not only digests the proteinaceous material but also dissolves the keratinised cells together. Thereby it helps in releasing the fungal elements. Hence fungal elements can be visualised against a clear background.

Procedure:

Clean glass slide was taken and the corneal scraping was placed on it. A drop of 10% KOH was added and cover slip was placed over it. Slide was viewed under 10x and then under 40 x to note the presence of septate or aseptate hyphae, conidia and budding yeast cells.

2) IDENTIFICATION OF FUNGI BY CULTURE:

Fungal isolates were identified by the following characteristics:

1) **Culture characteristics**:

SDA slopes were observed to note the

- Rate of growth
- Obverse of the colony to note the colour and texture of the colony.

- - Reverse of the colony to note the pigmentation and topography of the colony

2) Microscopy:

a) **Examination of Filamentous fungi:**

1) LPCB mount preparation

2) Slide culture technique.

1) LPCB mount:

It is used to study the microscopic morphology of the fungal isolates.

Principle:

LPCB mount contains lactic acid, phenol, cotton blue and glycerol. Lactic acid helps in preserving the morphology of the fungi. Phenol has an disinfectant action. Glycerol is a hygroscopic that prevents the drying of the mount. Cotton blue stains the outer layer of the fungus. Thus it acts as a stain and also as a mounting fluid.

Procedure:

1) A clean glass slide was taken and a drop of lactophenol cotton blue was placed on it.

2)With a help of dissecting needle, a small bit of colony was taken and placed on the slide and teased .

3)Cover slip was placed and the slide was examined microscopically first under 10 x and then under 40 x.

2)Slide culture technique:

It is used to study the undisturbed morphological details of the fungi.

Procedure:

1) A round piece of filter paper was placed on the bottom of a sterile petridish. A pair of thin glass rods were placed to serve as a support to the glass microscopic slide.
2) Two agar blocks each of one square centimetre was cut from the SDA block and placed aseptically on the glass slide.
3) The agar blocks were inoculated at the four corners with the small portion of the colony to be examined with a straight wire. A moistened gauze was placed inside the Petri dish . Petri dish was covered and incubated at room temperature for 3 to 5 days.
4) When the growth appears to be fully mature, coverslip was gently lifted from the surface of the agar with a pair of

forceps and placed on a drop of lactophenol cotton blue on the surface of a clean glass slide.

5) The slide was examined under 10x and then under 40x.

The antifungal susceptibility testing was done for the isolated fungi.

ANTIFUNGAL SUSCEPTIBILITY TESTING METHOD OF FILAMENTOUS FUNGI BY MODIFIED CLSI MICRO BROTH DILUTION METHOD(M38-A)[10]:

The antifungal susceptibility testing for filamentous fungi was done according to CLSI microbroth dilution method.

MATERIALS REQUIRED:

a) RPMI-1640 (with glutamine, without bicarbonate and with a pH indicator)
b) 34.53 g MOPS(3-N-Morpholino-propanesulfonic acid) buffer-Himedia.
c) Tween 20.
d) Anti fungal drugs: Powdered forms of Amphotericin B, Voriconazole Natamycin and Flucanozole
e) Microtiter trays (96 U bottomed wells).
f) 0.5 Mc Farland standard

g) Sterile saline (8.5 g/L NaCl; 0.85% saline).

h) Micropipettes (single and multichannel) and sterile tips for 100-µL volumes and 1000 -µ litre volumes.

EQUIPMENTS:

1) Biological safety cabinet (class IIA or IIB)
2) Autoclave
3) Water bath (48°C–50°C)
4) Vortex mixer
5) Incubator set at 35°C ± 1°C
6) Reading devices
7) A concave mirror reader or plate reader

1. Procedure for making RPMI-1640 medium:

RPMI is the preferred medium for performing antifungal susceptibility testing for filamentous fungi and must be buffered with MOPS(0.164 mol/L).

- The medium was dissolved in 900 mL of distilled water.
- MOPS buffer was added, stirred until dissolved.
- pH was adjusted to 7.0 at 25°C using 10 or 1 mol/L sodium hydroxide while stirring.
- Additional water was added to bring the medium to a final volume of 1 L.

2.Preparation of antifungal stock solution and drug dilutions.

Antifungal agents and its corresponding solvent:

a) Amphotericin B(Solvent-DMSO)

b) Voriconazole(Solvent:DMSO)

c) Natamycin(Solvent:DMSO)

d) Fluconazole(Solvent:Water)

Preparation of antifungal stock solution

The concentration of stock solution used for the above drugs is 1600mcg/ml except for Fluconazole and Natamycin which is 6400mcg/ml.

A) Drug dilution preparation for water insoluble antifungal drugs(Amphotericin B,Voriconazole,Natamycin)

The dilutions of the above drugs were prepared by using DMSO.

a) Nine test tubes (12 × 75 mm) size were taken and labelled from 3–11.

b) Appropriate amounts of DMSO to each tube were added as follows:

0.5 mL of DMSO to tubes 3, 6, and 9 were added.

0.75 mL of DMSO to tubes 4, 7, and 10 were added.

1.75 mL of DMSO to tubes 5, 8, and 11 were added.

c) The stock solution tube (1,600 μg/mL) was labelled as tube 2.

d) From tube 2, 0.5 ml was transferred to tube 3 and 0.25 mL to tubes 4 and 5.

e) From tube 5, 0.5 mL was transferred to tube 6 and 0.25 mL to tubes 7 and 8.

f) From tube 8, 0.5 ml was transferred to tube 9 and 0.25 mL to tubes 10 and 11.

g) Finally, 1 ml was discarded from tube 11.

The solution was mixed in a vortex mixer before each transfer step

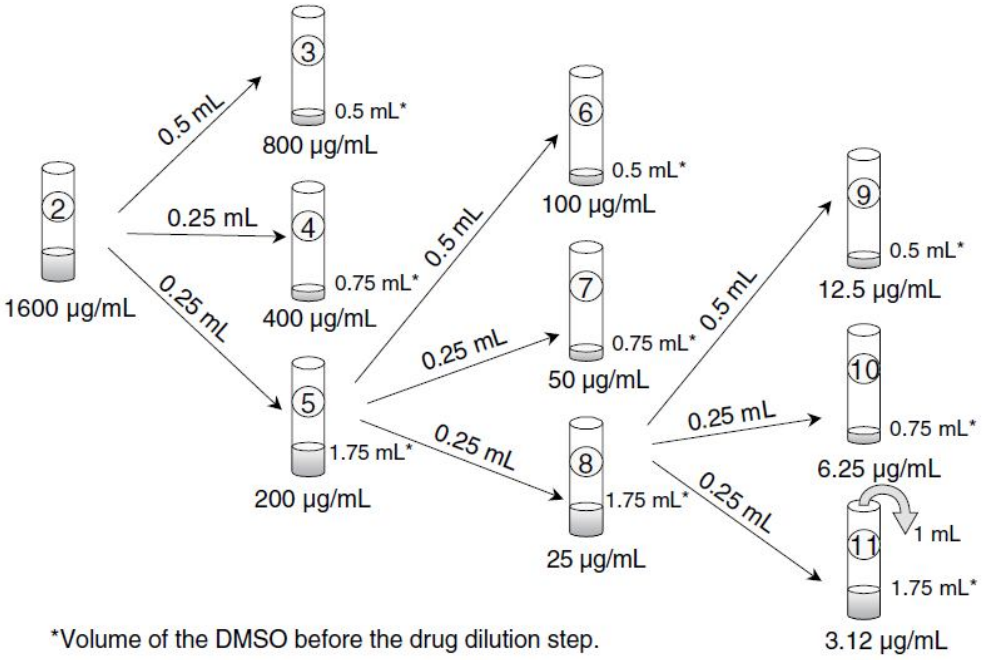


Figure 1: Diagramatic representation of preparation of antifungal stock solution .Figure adapted from Schwalbe et al.

For preparation of stock solution for water soluble drugs like Fluconazole , RPMI is used instead of DMSO.

B).Preparation of microdilution trays;

The tubes containing the drug dilutions (1 mL) were placed from the highest to the lowest drug concentration. A row of 10 tubes with the appropriate drug concentration were labelled.

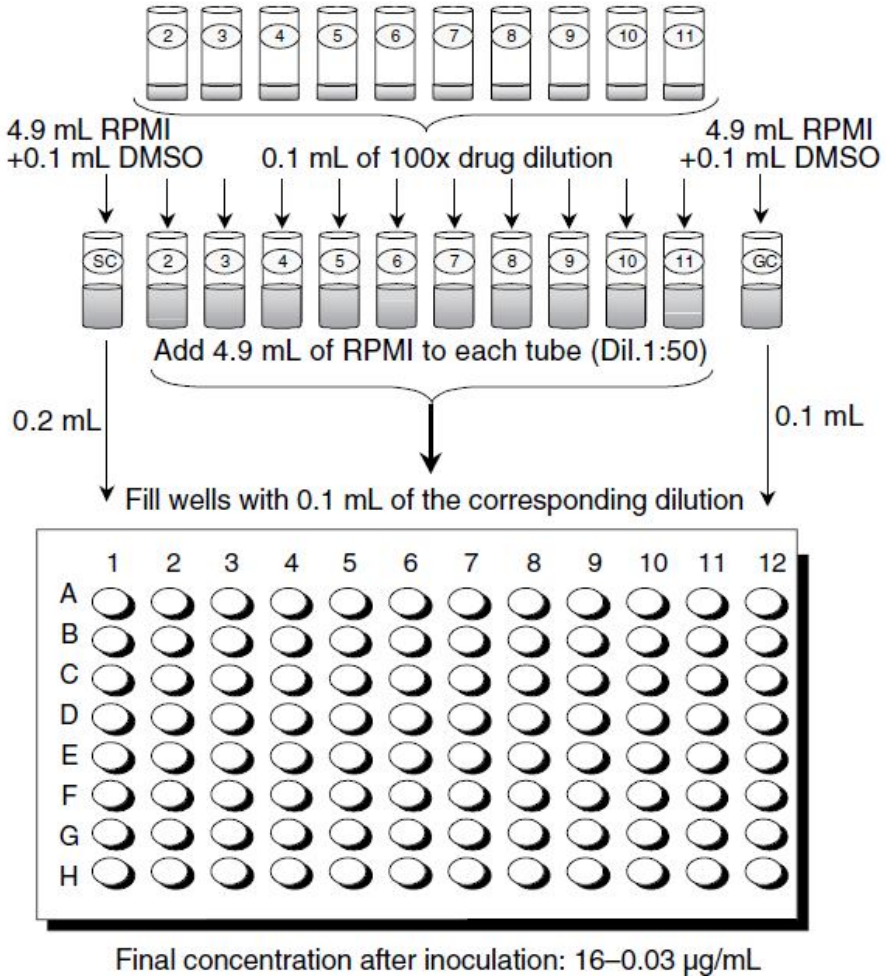
3. Inoculation step:

a) A 1:50 dilution is prepared by mixing 4.9 mL of RPMI with 0.1 mL from each drug dilution tube. Using a dispensing device, 0.1 mL from each of the final drug dilution tubes was transferred to the appropriate well in each microtiter tray.

b) 0.2 mL of RPMI plus 2% DMSO (or the solvent that was used) to column 1 of the microtiter tray was added and 0.1 mL of RPMI plus 2% DMSO (or the solvent that was used) was added to column 12. These two wells will serve as the negative (sterility) and positive (growth control) control wells, respectively, for the microtiter tray.

c) The concentration of the antifungal agents in the wells is now 2 times the concentration needed.

d) The concentration of DMSO in the wells is now 2%.



SC: sterility control (Tube 1)

GC: growth control (Tube12)

Figure 2: Diagramatic representation of preparation of microdilution test trays .

4. Preparation of inoculum

1) *Fusarium* spp. and Penicillium spp.was grown on potato dextrose agar for 48–72 h at 35°C and then at 25°C–28°C until day 7.
2) Conidia was recovered by wetting a loop with Tween 20 and loopful of conidia was transferred into 3 mL of sterile saline.
3) Conidia suspension was vortexed vigorously for 15–20 s to prevent clumping of the spores.
4) The heavy particles were allowed to settle for 3–5 min and then the upper suspension was transferred to a sterile tube and turbidity was adjusted using a spectrophotometer (530 nm) to the optical density (OD) that yields a stock suspension of 0.4–5 × 106 viable conidia or sporangiospores per milliliter..
5) A working suspension was prepared by diluting 1:50 of the conidia stock suspension in the standard medium; mix well with a vortex mixer.(200 micro litre of conidial stock suspension was added to 10 ml of RPMI)

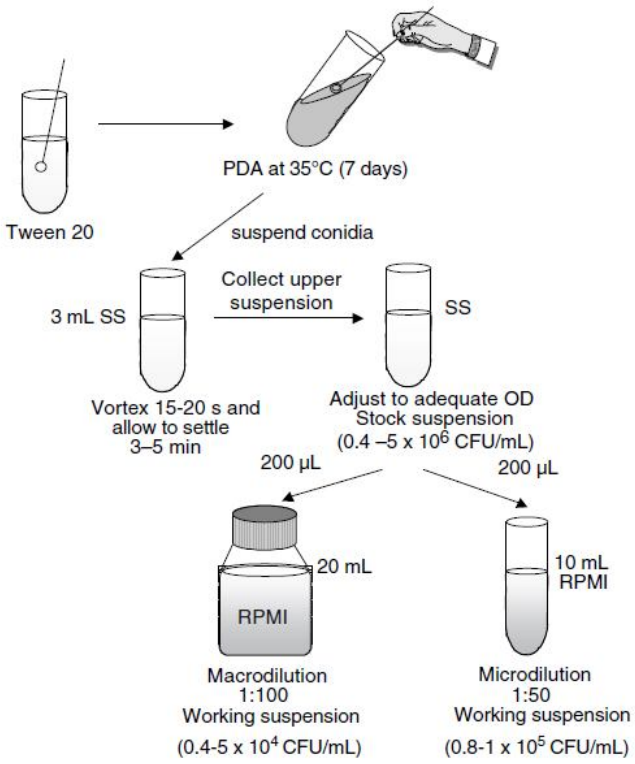


Figure 3:Diagramatic representation of inoculum preparation.

Now each row of the microtiter tray from wells 2–12 was filled with 0.1 mL of the working inoculums suspension using a pipette.

5.Incubation

- Trays were incubated without agitation in an aerobic incubator without CO_2 at 35°C for 46–50 hrs.

6.Reading and Interpretation of the results:

Visual reading

a. The trays were removed from the incubator.

b. The tray was placed on a reading device (mirror reader, or plate reader).

c. The growth control well must have sufficient growth.

d. The MIC endpoints (MIC50 and MIC 90) for each drug was determined according to the CLSI guidelines for antifungal susceptibility testing[10].

In case of endophthalmitis and panophthalmitis, aqueous and vitreous samples were collected and inoculated onto Blood agar plate, Mac conkey plate , chocolate agar plate and Sabouraud's dextrose agar in duplicates one kept at room temperature and the other at 37°c. Similar to other specimens , plates were examined to note for colony characteristics.

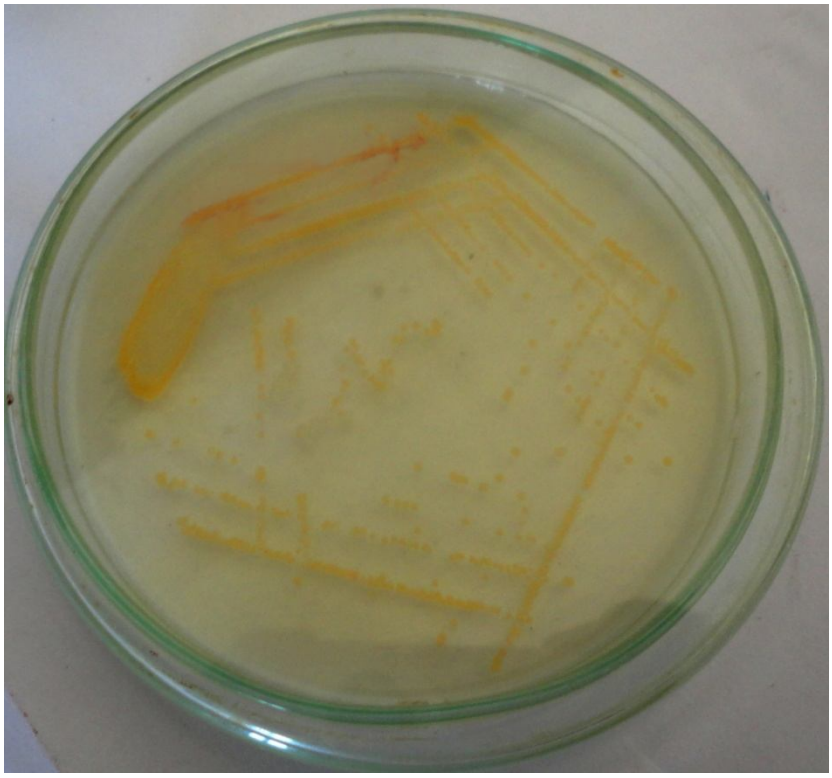


Fig. 1: Nutrient Agar Plate showing Staphylococcus aureus

Fig. 2: Blood Agar Plate showing Staphylococcus aureus

Fig. 3: Mueller Hinton Agar Plate showing Staphylococcus aureus

Fig. 4: MacConkey Agar Plate showing Klebsiella pneumoniae

Fig. 5: Blood Agar Plate showing Klebsiella pneumoniae

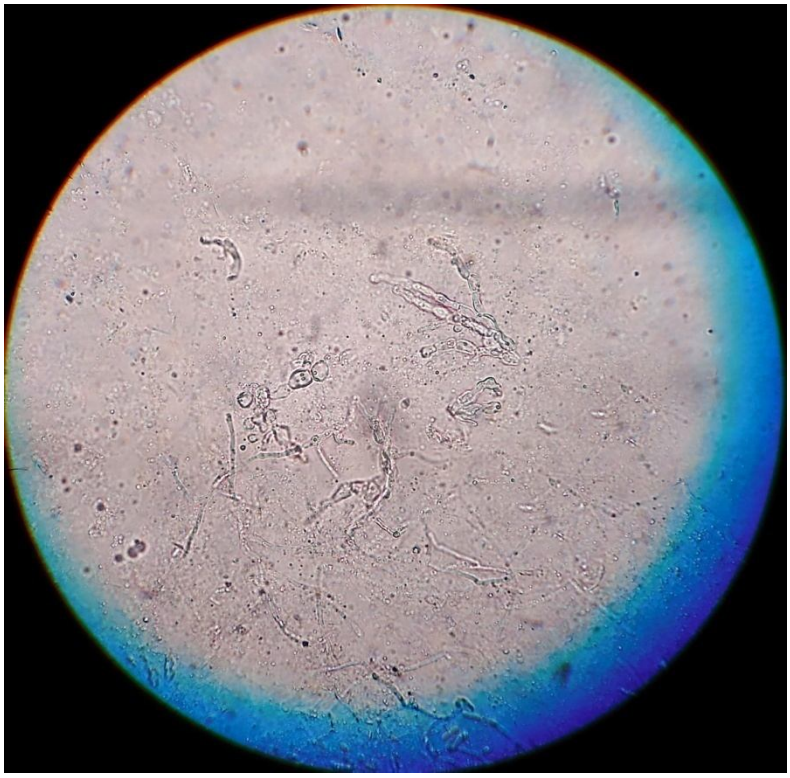


Fig. 6: Microscopy (10% KOH Mount) showing septate hyphae.

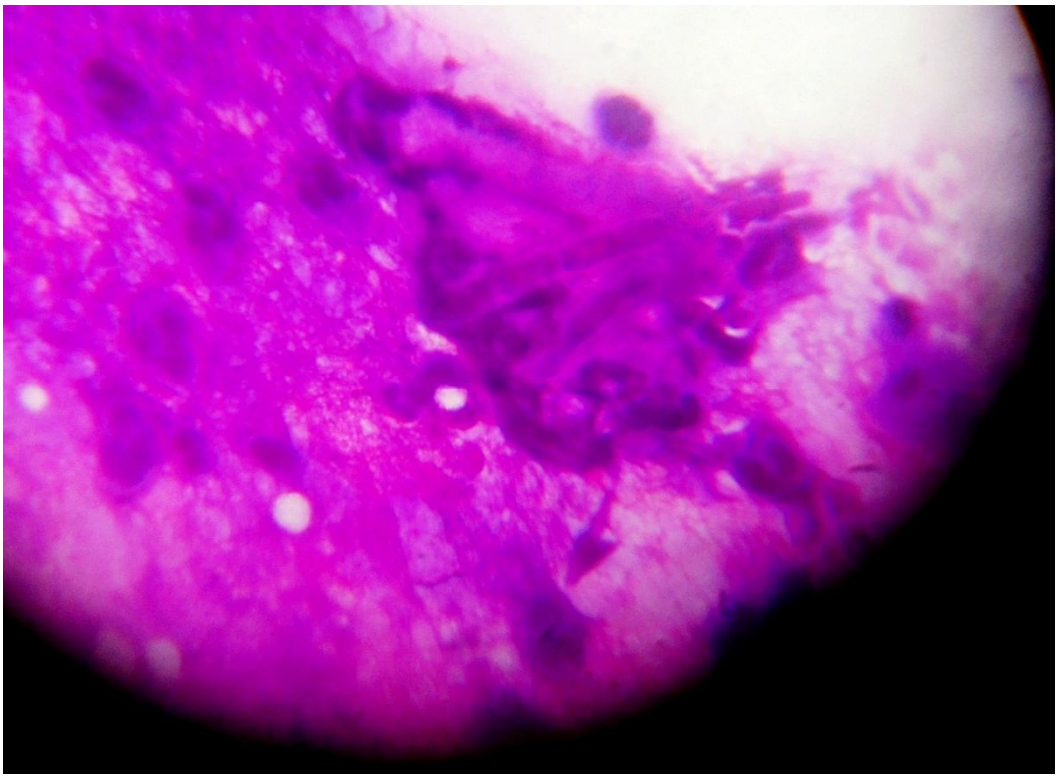


Fig. 7: Gram stain showing septate hyphae.

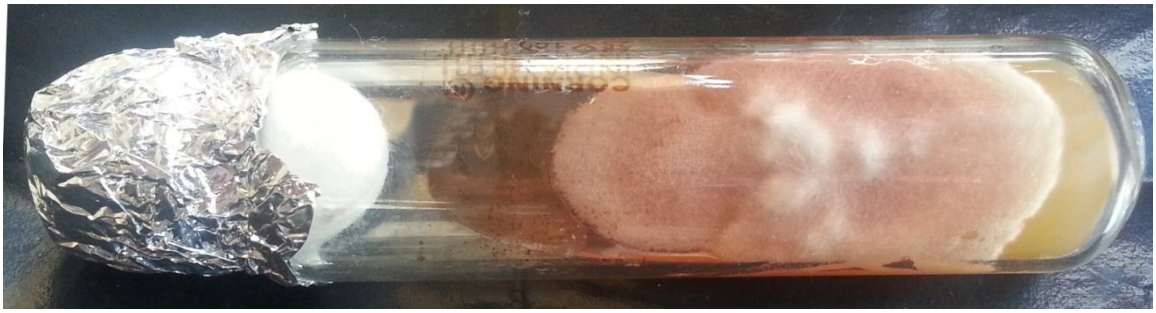


Fig. 8: Fusarium spp. – Obverse view.

Fig. 9: Fusarium spp. – Reverse view.

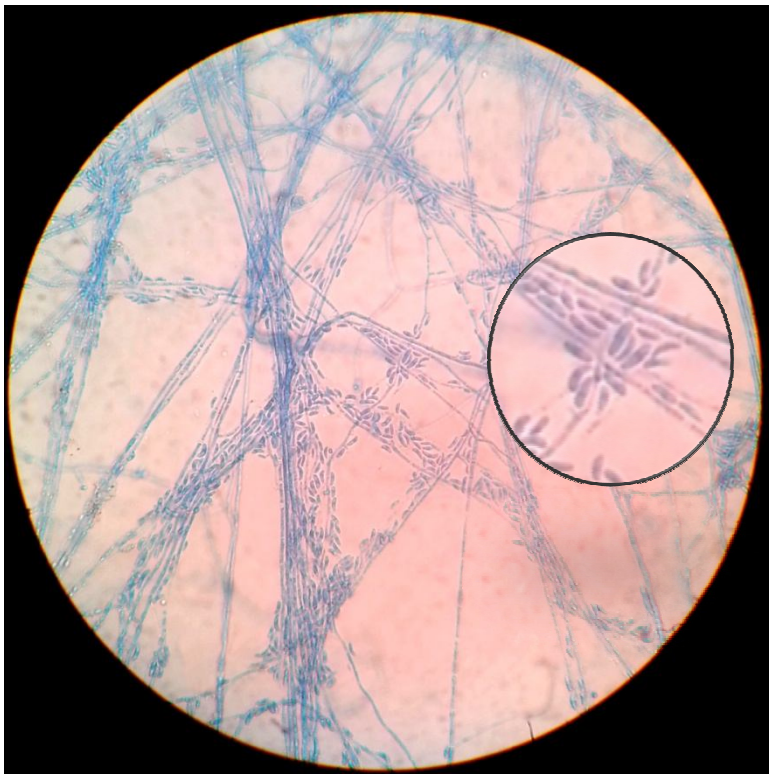


Fig. 10: LPCB Mount - Fusarium spp. Showing Macroconidia.

Fig. 11: Penicillium spp. – Obverse view.

Fig. 12: Penicillium spp. – Reverse view.

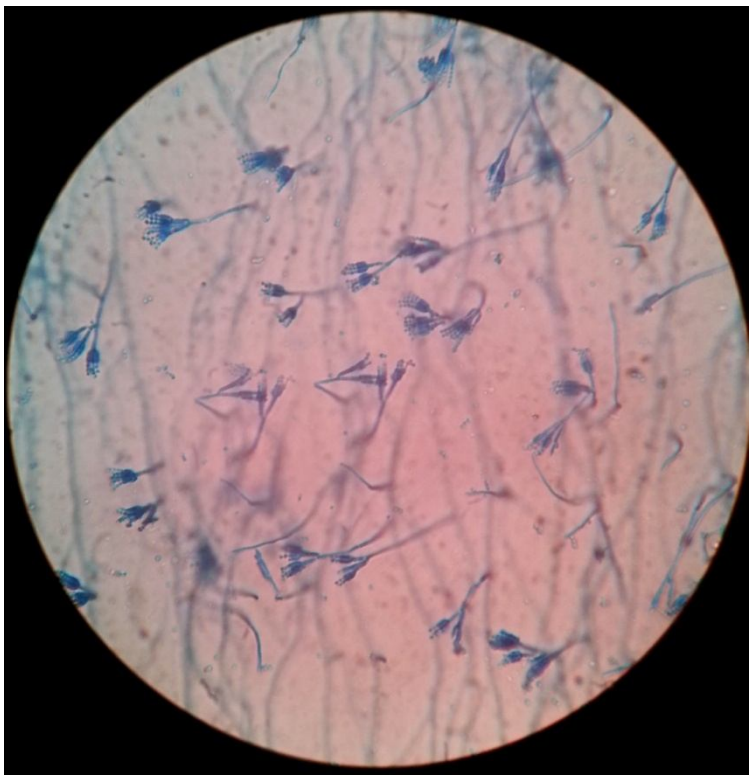


Fig. 13: LPCB Mount - Penicillium spp.

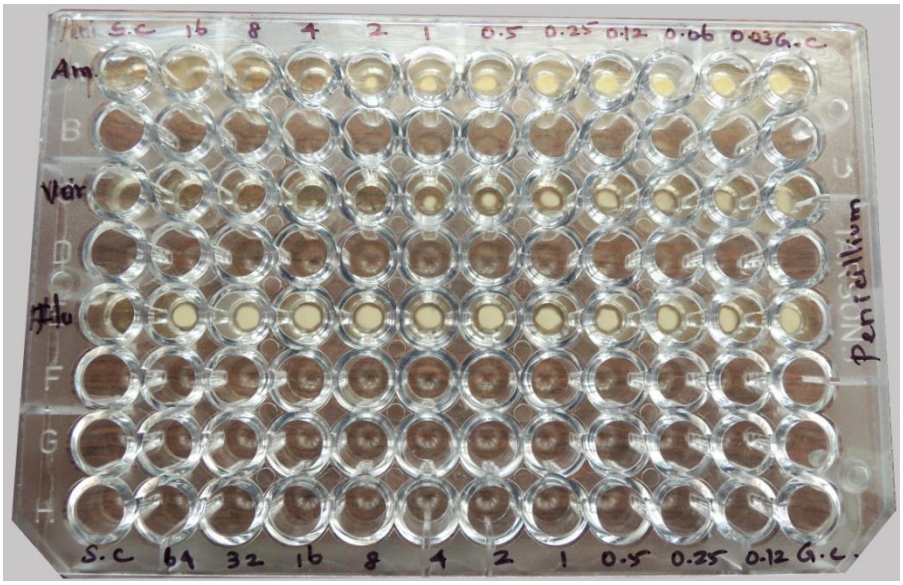


Fig. 14: Antifungal susceptibility pattern of Penicillium.

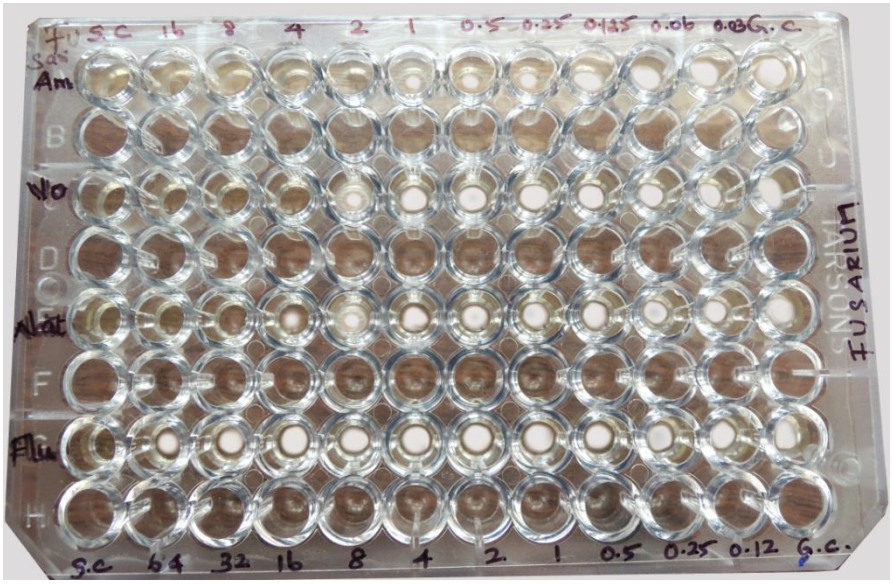


Fig. 15: Antifungal susceptibility pattern of Fusarium.

RESULTS

RESULTS

A total of 222 cases of ocular infections were analysed over a period of one year from August 2013 to July 2014.

Among them , 96 cases were clinically diagnosed as conjunctivitis, keratitis constituted 30 cases, lacrimal sac infections constituted 53 cases, eyelid infections comprised of 37 cases and intraocular infections (endophthalmitis and panophthalmitis) constituted 6 cases. The statistical analysis was done by using SPSS version 17 and P values was obtained by Pearson Chi-Square test.

Table1: **Age wise Distribution of Conjunctivitis cases**

Age group (In Years)	No. of cases (n=96)	Percentage
0-10	13	13.5%
11-20	8	8.3%
21-30	6	6.3%
31-40	11	11.5%
41-50	14	14.6%
51-60	18	18.8%
61-70	15	15.6%
>70	11	11.5%
Total	96	100%

Table 2: Sex wise Distribution of Conjunctivitis cases

Sex	No. of cases (n=96)	Percentage
Male	46	47.9%
Female	50	52.1%
Total	96	100.0%

Table 3: Prevalence of culture positive cases of Conjunctivitis

S.No	Culture	No. of cases	Percentage
1.	Positive	41	42.7%
2.	Negative	55	57.3%
	Total	96	100.0%

Table 4: Age and Sex wise distribution of culture positive cases of conjunctivitis

Age-group (In years)	No. of positives		Total
	Male	Female	
0-10	2(12.5)	4(16)	6(14.6)
11-20	1(6.25)	1(4)	2(4.9)
21-30	-	1(4)	1(2.4)
31-40	5(31.25)	3(12)	8(19.5)
41-50	4(25)	5(20)	9(21.9)
51-60	1(6.25)	6(24)	7(17.1)
61-70	3(18.75)	4(16)	7(17.1)
≥ 70	-	1(4)	1(2.4)
Total	16	25	41(100)

Table5: Distribution of organisms in conjunctivitis

S.No	Organism	No. of cases	Percentage
1.	Gram positive cocci	31	75.6%
2.	Gram negative bacilli	10	24.4%
	Total	41	100.0%

Table6: Distribution of conjunctivitis cases according to spectrum of Gram positive cocci

S.No	Organism	No. of cases	Percentage
1.	Staph.aureus	21	67.7%
2.	CoNS	8	25.8%
3.	Strep.pneumoniae	2	6.5%
Total		31(100)	100.0%

Table 7: Distribution of conjunctivitis cases according to spectrum of Gram negative bacilli

S.No.	Organism	No. of cases	Percentage
1.	E.coli	7	70%
2.	Kleb. pneumoniae	3	30%
Total		10	100%

Table 8: Distribution of organisms among various age groups in conjunctivitis

Age group(yrs)	Staph aureus	CoNS	Strep. pneumoniae	E.coli	Kleb. pneumoniae	Total
0-10	3(7.3)	1(2.4)	2(4.9)	-	-	6(14.6)
11-20	2(4.9)	-	-	-	-	2(4.9)
21-30	-	1(2.4)	-	-	-	1(2.4)
31-40	5(12.2)	1(2.4)	-	1(2.4)	1(2.4)	8(19.5)
41-50	7(17.1)	-	-	2(4.9)	-	9(22.0)
51-60	2(4.9)	3(7.3)	-	1(2.4)	1(2.4)	7(17.1)
61-70	2(4.9)	1(2.4)	-	3(7.3)	-	6(14.6)
≥70	-	1(2.4)	-	-	1(2.4)	2(4.9)
Total	21(51.2)	8(19.5)	2(4.9)	7(17.1)	3(7.3)	41(100)

Table 8: Distribution of organisms among various age groups in conjunctivitis

Age group(yrs)	Staph aureus	CoNS	Strep. pneumoniae	E.coli	Kleb. pneumoniae	Total
0-10	3(7.3)	1(2.4)	2(4.9)	-	-	6(14.6)
11-20	2(4.9)	-	-	-	-	2(4.9)
21-30	-	1(2.4)	-	-	-	1(2.4)
31-40	5(12.2)	1(2.4)	-	1(2.4)	1(2.4)	8(19.5)
41-50	7(17.1)	-	-	2(4.9)	-	9(22.0)
51-60	2(4.9)	3(7.3)	-	1(2.4)	1(2.4)	7(17.1)
61-70	2(4.9)	1(2.4)	-	3(7.3)	-	6(14.6)
≥70	-	1(2.4)	-	-	1(2.4)	2(4.9)
Total	21(51.2)	8(19.5)	2(4.9)	7(17.1)	3(7.3)	41(100)

Table 9: Antibiotic sensitivity of the isolated organisms in conjunctivitis

Antibiotic	Staph.aureus (n-21)		CoNS (n-8)		E.coli (n-7)		Kleb.pneumoniae (n-3)		Strep.pneumoniae (n-2)	
	S	R	S	R	S	R	S	R	S	R
AK	20 (95.2%)	1 (4.8%)	7 (87.5%)	1 (12.5%)	7 (100%)	-	3 (100%)	-	-	2 (100%)
G	18 (85.7%)	3 (14.3%)	6 (75.0%)	2 (25.0%)	6 (85.7%)	1 (14.3%)	1 (33.3%)	2 (66.7%)	1 (50%)	1 (50%)
CIP	19 (90.5%)	2 (9.5%)	8 (100%)	-	2 (28.6%)	5 (71.4)	3 (100%)	-	2 (100%)	-
OF	18 (85.7%)	3 (14.3%)	7 (87.5%)	1 (12.5%)	3 (42.9%)	4 (57.1%)	3 (100%)	-	1 (50)%	1 (50%)
DO	11 (52.4%)	10 47.6%)	6 (75.0%)	2 (25.0%)	2 (28.6%)	5 (71.4%)	-	3 (100%)	2 (100%)	
E	7 (33.3%)	14 (66.7%)	4 (50%)	4 (50%)	-	-	-	-	2 (100%)	
VAN	21 (100%)	-	6 (75.0%)	2 (25.0%)	-	-	-	-	2 (100%)	
CHLOR	7 (33.3%)	14 (66.7%)	2 (25.0%)	6 (75.0%)	2 (28.6%)	5 (71.4%)	1 (33.3%)	2 (66.7%)	2 (100%)	
CTR	16 (76.2%)	5 (23.8%)	5 (62.5%)	3 (37.5%)	1 (14.3%)	6 (85.7%)	2 (66.7%)	1 (33.3%)		
COT	12 (57.1%)	9 (42.9%)	3 (37.5%)	5 (62.5%)	1 (14.3%	6 (85.7%)	1 (33.3%)	2 (66.7%)	1 (50%)	1 (50%)

Table 10: Age wise distribution of Keratitis cases

Age group (In years)	No. of cases (n=30)	Percentage
0-10	-	-
11-20	1	3.3%
21-30	2	6.7%
31-40	3	10.0%
41-50	10	33.3%
51-60	4	13.3%
61-70	7	23.3%
>70	3	10.0%
Total	30	100%

Table 11: Sex wise Distribution of keratitis cases

Sex	No. of cases (n=30)	Percentage	
Male	18	60%	Male and Female ratio 1.5:1
Female	12	40%	
Total	30	100%	

Table 12: Age wise and sex wise distribution of Keratitis cases

Age group (In years)	Sex		Total
	Male	Female	
0-10	-	-	-
11-20	-	1(8.3%)	**1(3.3%)**
21-30	1(5.6%)	1(8.3%)	**2(6.7%)**
31-40	1(5.6%)	2(16.7%)	**3(10.0%)**
41-50	8(44.4%)	2(16.7%)	**10(33.3%)**
51-60	2(11.1%)	2(16.7%)	**4(13.3%)**
61-70	6(33.3%)	1(8.3%)	**7(23.3%)**
>70	-	3(25.0%)	**3(10.0%)**
Total	**18**	**12**	**30(100%)**

Table 13: Occupational incidence of keratitis cases

S.No	Occupation	No. of Cases (n = 30)	Percentage
1.	Farmer	20	66.6%
2.	Carpenter	3	10%
3.	House Wife	2	6.7%
4.	Labourer	2	6.7%
5.	Barber	2	6.7%
6.	Student	1	3.3%
	Total	30	100%

Table 14: Predisposing factors in keratitis

S.No	Predisposing Factors	No. of Cases (n=30)	Percentage
1	Trauma	20	66.6%
2	Topical corticosteroid	3	10%
3	Post-keratoplasty	2	6.7%
4	Foreign body	2	6.7%
5	Contact lens wear	1	3.3%
6	Unknown	2	6.7%
	Total	30	100%

Table 15: Direct microscopy (10% KOH) findings among keratitis cases

10% KOH mount	No. of Cases	Percentage
Positive	15	50%
Negative	15	50%
Total	30	100%

Table 16: Microscopy (10% KOH) versus culture among keratitis cases

10% KOH mount	Culture		Total
	Positive	Negative	
Positive	7(23.3%)	8(26.7%)	15(50%)
Negative	1(3.3%)	14(46.7%)	15(50%)
Total	8(26.7%)	22(73.3%)	30(100%)

Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Pearson chi-square test		
				Value	Degree of freedom	p-value
87.5	63.6	93.3	46.7	6.136	1	0.013

Hence p-value is 0.013 (p-value should be less than 0.05). Thus it is statistically significant. So there is no significant difference between the microscopy and Culture.

Table 17: Fungal isolates obtained from cases of keratitis

Fungal isolates	No of isolates	Percentage
Fusarium sp.	6	75%
Penicillium sp.	2	25%
Total	8	100%

Table 18: Antifungal susceptibility pattern of Fusarium spp.

Antifungal Drugs	**Fusarium spp.**	
	MIC(µg/ml)	
Amphotericin B	**MIC 50**	**0.25**
	MIC 90	**2**
Voriconazole	**MIC 50**	**2**
	MIC 90	**4**
Natamycin	**MIC 50**	**2**
	MIC 90	**8**
Fluconazole	**MIC 50**	**64**

Table 19: Antifungal susceptibility pattern of Penicillium spp.

Antifungal Drugs	**Penicillium Spp.**	
	MIC(µg/ml)	
Amphotericin B	**MIC 50**	**0.5**
	MIC 90	**4**
Voriconazole	**MIC 50**	**1**
	MIC 90	**2**
Fluconazole	**MIC 50**	**64**

Table 20: Age and Sex wise Distribution of Dacryocystitis cases

Age (yrs)	**SEX**		**Total**
	Male	**Female**	
0-10	1(5.6)	-	1(1.9)
11-20	2(11.1)	5(14.3)	7(13.2)
21-30	-	6(17.1)	6(11.3)
31-40	1(5.6)	2(5.7)	3(5.7)
41-50	2(11.1)	6(17.1)	8(15.1)
51-60	8(44.4)	8(22.9)	16(30.2)
61-70	3(16.7)	8(22.9)	11(20.8)
≥70	1(11.1)	-	1(1.9)
Total	18	35	53(100)

Table 21: Sex wise distribution of Dacryocystitis cases.

S.No.	Sex	No. of Cases	Percentage
1.	Male	18	34%
2.	Female	35	66%
	Total	53	100%

Table 22: Prevalence of culture positive cases of Dacryocystitis

S.No.	Culture	No. of Cases	Percentage
1.	Positive	28	52.8%
2.	Negative	25	47.2%
	Total	53	100.0%

Table 23: Distribution of organisms in Dacryocystitis cases

S.No.	Organism	No. of Cases	Percentage
1.	Gram positive cocci	22	78.6%
2.	Gram negative bacilli	6	21.4%
	Total	28	100.0%

Table 24: Distribution of gram positive isolates in Dacryocystitis cases

S.No.	Organism	No. of Cases	Percentage
1.	Staph.aureus	13	59.1%
2.	CoNS	9	40.9%
	Total	22	100.0%

Table 25: Distribution of gram negative isolates in Dacryocystitis

S.No.	Organism	No. of Cases	Percentage
1	E.coli	4	66.7%
2	Klesiella pneumoniae	2	33.3%
	Total	6	100.0%

Table 26: Age wise Distribution of organisms in Dacryocystitis

Age group (yrs)	Staph.aureus	CoNS	E.coli	Klesiella pneumoniae	Total
0-10	1(3.6)	-	-	-	1(3.6)
11-20	-	3(10.7)	-	-	3(10.7)
21-30	1(3.6)	1(3.6)	1(3.6)	-	3(10.7)
31-40	1(3.6)	-	1(3.6)	-	2(7.1)
41-50	1(3.6)	2(7.1)	1(3.6)	-	4(14.3)
51-60	5(17.9)	1(3.6)	1(3.6)	1(3.6)	8(28.6)
61-70	4(14.3)	2(7.1)	-	1(3.6)	7(25.0)
≥70	-	-	-	-	
Total	13(46.4)	9(32.1)	4(14.3)	2(7.1)	28(100)

Table 27: Antibiotic sensitivity pattern of organisms in lacrimal sac infections

Antibiotic	Staph.aureus (n=13)& %		CoNS (n=9)&%		E.coli (n=4)&%		Klebsiella pneumoniae (n=2)& %	
	S	**R**	**S**	**R**	**S**	**R**	**S**	**R**
Ak	5 (38.5)	8 (61.5)	4 (44.4)	5 (55.6)	4 (100)	-	2 (100)	-
G	11 (84.6)	2 (15.4)	7 (77.8)	2 (22.2)	4 (100)	-	2 (100)	-
Cip	10 (76.9)	3 (23.1)	6 (66.7)	3 (33.3)	2 (50)	2 (50)	1(50)	1 (50)
Of	11 (84.6)	2 (15.4)	9 (100)	-	1 (25)	3 (75)	2 (100)	-
Do	8 (61.5)	5 (38.5)	8 (88.9)	1 (11.1)	1 (25)	3 (75)	-	2 (100)
E	7 (53.9)	6 (46.1)	8 (88.9)	1 (11.1)	-	-	-	-
Van	13 (100)	-	9 (100)	-	-	-	-	-
chlor	12 (92.3)	1 (7.1)	9 (100)	-	4 (100)	-	-	2 (100)
Cot	9 (69.2)	4 (30.8)	1 (11.1)	8 (88.9)	1 (25)	3 (75)	-	2 (100)
Ctr	5 (38.5)	8 (61.5)	2 (22.2)	7 (77.8)	3 (75)	1 (25)	2 (100)	-
Amc	11 (84.6)	2 (15.4)	7 (71.8)	2 (22.2)	-	-	-	-

Table 28: Age and sex wise Distribution of organisms in eyelid infections

Age group(yrs)	Male	Female	Total
0-10	1(6.25%)	1(4.8%)	2(5.4%)
11-20	2(12.5%)	-	2(5.4%)
21-30	4(25.0%)	1(4.8%)	5(13.5%)
31-40	4(25.0%)	-	4(10.8%)
41-50	2(12.5%)	1(4.8%)	3(8.1%)
51-60	1(6.3%)	8(38.1%)	9(24.3%)
61-70	2(12.5%)	5(23.8%)	7(18.9%)
≥70	-	5(23.8%)	5(13.5%)
Total	16(43.2%)	21(56.8%)	37(100%)

Table 29: Prevalence of culture positive cases of Eyelid infections

S.No.	Culture	No. of Cases	Percentage
1.	Positive	21	56.8%
2.	Negative	16	43.2%
	Total	37	100.0%

Table 30: Distribution of organisms in Eyelid infections

S.No.	Organism	No. of Cases	Percentage
1.	Staph aureus	9	42.9%
2.	CoNS	12	57.1%
	Total	21	100.0%

Table 31: Antibiotic sensitivity pattern of organisms in eyelid infections

Antibiotic	Staph aureus (n=9)		CoNS (n=12)	
	S	R	S	R
AK	6 (66.7%)	3 (33.3%)	7 (52.3%)	5 (41.7%)
G	8 (88.9%)	1 (11.1%)	8 (66.7%)	4 (31.3%)
CIP	8 (88.9%)	1 (11.1%)	9 (75%)	3 (25%)
OF	9 (100%)	-	9 (75%)	3 (25%)
COT	7 (77.8%)	2 (22.2%)	5 (41.7%)	7 (58.3%)
CHLO	8 (88.9%)	1 (11.1%)	4 (33.3%)	8 (66.7%)
VAN	9 (100%)	-	11 (91.7%)	1 (8.3%)
DO	9 (100%)	-	10 (83.3%)	2 (16.7%)
E	8 (88.9%)	1 (11.1%)	3 (25%)	9 (75%)

The most common age group affected among conjunctivitis cases was 51 – 60 years (18.8%) **(Table-1).**

Among 96 conjunctivitis cases, 46 (47.9%) were males and 50 (52.1%) were females. Females were more commonly affected than males **(Table-2)** .

Out of 96 conjunctivitis cases, 41 (42.7%) yielded bacterial growth**. (Table-3)**. These positive samples were from 16 males (39.02%) and 25 females (60.09%)**.(Table-4)**

Among the 41 positive cases in conjunctivitis, gram positive cocci accounted for majority of the cases 31 (75.6%) followed by gram negative bacilli 10 (24.4%)**.(Table-5)**The predominant isolate among gram positive isolates was Staph.aureus 21 (67.7%), followed by CoNS 8 (25.8%) and Strep.pneumoniae 2 (6.5%) **(Table-6).**

The predominate isolate among gram negative bacilli was E.coli 7 (70%) and next isolated was Klebsiella pneumoniae 3 (30%).(**Table-7)**

Staph. aureus was the common organism isolated in the age group of 0 -50 yrs except in the age group of 21-30 yrs which is dominated by CoNS. CoNS was the commonest organism isolated in

the age group of 51-60 yrs (7.3%). Strep. pneumoniae was most commonly isolated in ≤ 10 yrs. age group.

E.coli was the most predominant isolate in the age group of 61-70 yrs (7.3%). In the age group ≥70 yrs, CoNS and Klebsiella pneumoniae were isolated. **(Table-8)**

The antibiotic sensitivity pattern of conjunctivitis showed that Staph. aureus was 100% sensitive to Vancomycin, 95.2% sensitive to Amikacin, 90.5% to Ciprofloxacin, 85.7% to Gentamycin and Ofloxacin, (76.2%) to Ceftriaxone, 57.1% to Cotrimoxazole and 52.4% sensitive to Doxycycline.

They were 66.7% resistant to Erythromycin and Chloramphenicol.

Coagulase Negative Staphylococci was 100% susceptible to Ciprofloxacin, 87.5% sensitive to Ofloxacin and Amikacin. CoNS was 75.0% sensitive to Gentamycin , Doxycycline and Vancomycin and 62.5% sensitive to Ceftriaxone.

They showed 75% resistance to Chloramphenicol ,62.5% resistant to Cotrimoxazole and 50% resistance to Erythromycin.

Strep. pneumoniae was 100% sensitive to Ciprofloxacin, Doxycycline,Erythromycin,Vancomycin and Chloramphenicol and 100% resistant to Amikacin and 50% resistant to Gentamycin and Of loxacin

E.coli showed high susceptibility rates to Amikacin (100%), Gentamycin(85.7%), Ceftriaxone (85.7%) and Cotrimoxazole (85.7%). and resistant to Ciprofloxacin (71.4%), Doxycycline(71.4%), Chloramphenicol(71.4%) and Ofloxacin(57.1%).

Klebsiella pneumoniae showed high sensitivity to Amikacin (100%), Ciprofloxacin (100%), Ofloxacin (100%) and Ceftriaxone (66.7%) and resistant to Doxycycline (100%), Gentamycin (66.7%), Chloramphenicol (66.7%) and Cotrimoxazole(66.7%).

The antibiotic sensitivity pattern of organisms isolated in conjunctivitis cases is shown in **Table -9**

Among 30 patients with Keratitis, the most commonly affected people were males in the age group of 41-50 yrs (33.3%)**.(Table-10)**

18 (60.0%) were males and 12 (40.0%) were females. Male : Female ratio is 1.5 : 1. **(Table-11) & (Table-12)**

Farmers 20 (66.6%) were more commonly affected followed by carpenters 3 (10%), %), house wives 2 (6.7%) labourers 2 (6.7%), barbers 2 (6.7%) and student 1 (3.3%)**.(Table-13)**

The predisposing factors associated with Keratitis were trauma 20 (66.6%), chronic topical corticosteroid usage 3 (10%), post keratoplasty 2 (6.7%), foreign body 2 (6.7%), contact lens wear 1 (3.30%) and unknown 2 (6.70%)**.(Table-14)**

Among 30 cases with Keratitis, 15 cases (50%) were positive by direct microscopy with 10% KOH mount and another 15 cases (50%) were negative**.(Table-15**)

Out of 15 cases positive by Direct microscopy with 10% KOH mount, 7 cases (23.3%) showed growth on culture and 8 cases (26.7%) were negative for culture in Sabourauds dextrose agar.

Out of 15 cases negative on direct microscopy with 10% KOH mount, only 1 case (3.3%) was positive by culture and the remaining 14 cases were negative on culture on Sabourauds dextrose agar**.(Table-16).**The sensitivity of KOH mount was 87.5% and the specificity of the test was 63.6%. p-value was 0.013 which was statistically significant.

Out of 8 cases positive for fungal aetiology, 6 cases (75%) were found to be Fusarium sp. and 2 cases (25%) were found to be Penicillium sp**.(Table-17)**

The antifungal susceptibility testing was done for Fusarium spp. and Penicillium spp.The MIC values obtained for Amphotericin B, Voriconazole, Natamycin and Fluconazole against Fusarium were as follows**.(Table-18)**

Amphotericin B: MIC 50 = 0.25 µg/ml and MIC 90 =2µg/ml

Voriconazole : MIC 50 = 2 µg/ml and MIC 90 =4µg/ml

Natamycin : MIC 50 = 2 µg/ml and MIC 90 =8µg/ml

Fluconazole : MIC 50 = 64 µg/ml

The above values showed that Fusarium spp. was susceptible to Amphotericin B, Voriconazole and Natamycin and resistant to Fluconazole.

The MIC values obtained for Amphotericin B, Voriconazole and Fluconazole against Penicillium were as follows **(Table -19)**

Amphotericin B: MIC 50 = 0.5 µg/ml and MIC 90 =4µg/ml

Voriconazole : MIC 50 = 1 µg/ml and MIC 90 =2µg/ml

Fluconazole : MIC 50 = 64 µg/ml

The values showed that Penicillium spp. was susceptible to Amphotericin B and Voriconazole and resistant to Fluconazole.

Among patients with Dacryocystitis, the most common age group affected was 51-60 yrs (30.2%).(**Table-20)**

18 (34.0%) were males and 35 (66.0%) were females. Females were more commonly affected than males**. (Table-21)**

Among the total of 53 cases of Dacryocystitis , bacterial growth was seen in 28 cases(52.8%).(**Table-22)** The common organisms isolated were gram positive cocci 22 (78.6%) followed by the gram negative bacilli 6 (21.4%).(**Table-23)**

Out of 22 isolates of gram positive cocci, Staph aureus constituted 13 (59.1%) and CoNS constituted 9 (40.9%).(**Table-24)**

Out of 6 isolates of gram negative organisms, majority were E.coli 4 (66.7%) followed by Klebsiella pneumoniae 2 (33.3%)**.(Table-25)**

In Dacryocystitis cases, Staph. aureus was the common isolate in the age group 51-60 yrs.

CoNS was mostly isolated in the age group of 11-20 yrs. and 41-50 yrs .E.coli was isolated in the age group of 21-60 yrs. Klebsiella pneumoniae was isolated in the age group 51-60 yrs and 61-70 yrs. The age wise distribution of organisms in Dacryocystitis cases is shown in (**Table-26)**

The antibiotic sensitivity of organisms isolated in lacrimal sac infections showed that Staph. aureus was 100% sensitive to Vancomycin, 92.3% to Chloramphenicol, 84.6% to Amoxy-clavulanic acid, Gentamycin and ofloxacin, 76.9% sensitive to Ciprofloxacin, 61.5% to Doxycycline and intermediate sensitivity to Erythromycin (53.9%).They showed 61.5% resistance to Amikacin and Ceftriaxone. .

CONS showed 100% susceptibility to Ofloxacin, Chloramphenicol and Vancomycin followed by 88.9% sensitivity to Doxycycline and Erythromycin , 77.8% susceptibility to Gentamycin and Amoxy-clavulanic acid showed 71.8% sensitivity.

They were resistant to Cotrimoxazole (88.9%), Ceftriaxone (77.8%) and Amikacin(55.6%).

E.coli showed high susceptibility to Amikacin,Gentamycin and Chloramphenicol (100%) followed by 75% sensitivity to Ceftriaxone .The resistance pattern showed 75% resistance towards Ofloxacin , Doxycycline and Cotrimoxazole and 50% to Ciprofloxacin .

Kleb.pneumoniae was 100% susceptible to Amikacin,Gentamycin, Ofloxacin, Ceftriaxone and showed 100% resistance to Doxycycline,Chloramphenicol and Cotrimoxazole and 50% resistance to Ciprofloxacin.The antibiotic sensitivity pattern of Dacryocystitis cases is shown in (**Table-27.)**

Among 37 cases of eyelid infections, the commonest age group affected was 51-60 yrs**.** 16 (43.2%) were males and 21 (56.8%) were females . **(Table-28)**.Out of 37 cases, the bacterial growth was seen in 21 cases(56.8%). **(Table-29)**.Out of 21 cases,

Staph. aureus constituted 9 (42.9%) and CONS constituted 12 (57.1%).(**Table-30)**

Staph.aureus was 100% susceptible to Vancomycin, Ofloxacin , Doxycycline, 88.9% to Gentamycin, Ciprofloxacin and Chloramphenicol and Erythromycin .The antibiotic sensitivity of Staph.aureus to cotrimoxazole was 77.8% and to Amikacin was 66.7%.

CONS was most sensitive to Vancomycin (91.9%), Doxycycline (83.3%), Ciprofloxacin (75%), Ofloxacin (75%), Gentamycin (66.7%), Amikacin (52.3%) and resistant to Erythromycin (75%), Chloramphenicol (66.7%) and Cotrimoxazole (58.3%).

The antibiotic sensitivity pattern of eyelid infection cases is shown in **Table-31.**

Six intraocular samples (5 vitreous samples and 1 aqueous sample) were received from post-operative endophthalmitis patients. These samples were subjected to direct microscopy by gram staining and culture .The samples were negative by culture.

CHART-1: AGE AND SEX WISE DISTRIBUTION OF CULTURE POSITIVE CASES OF CONJUNCTIVITIS

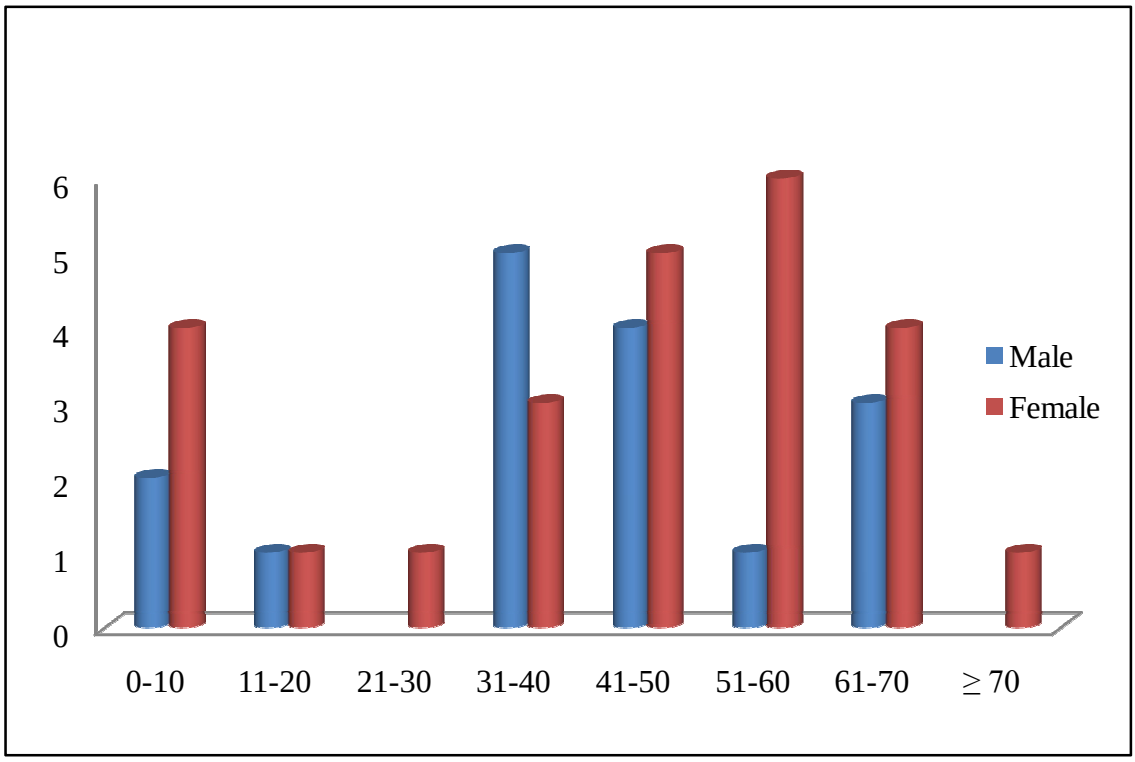


CHART 2: DISTRIBUTION OF CONJUNCTIVITIS CASES ACCORDING TO SPECTRUM OF GRAM POSITIVE COCCI.

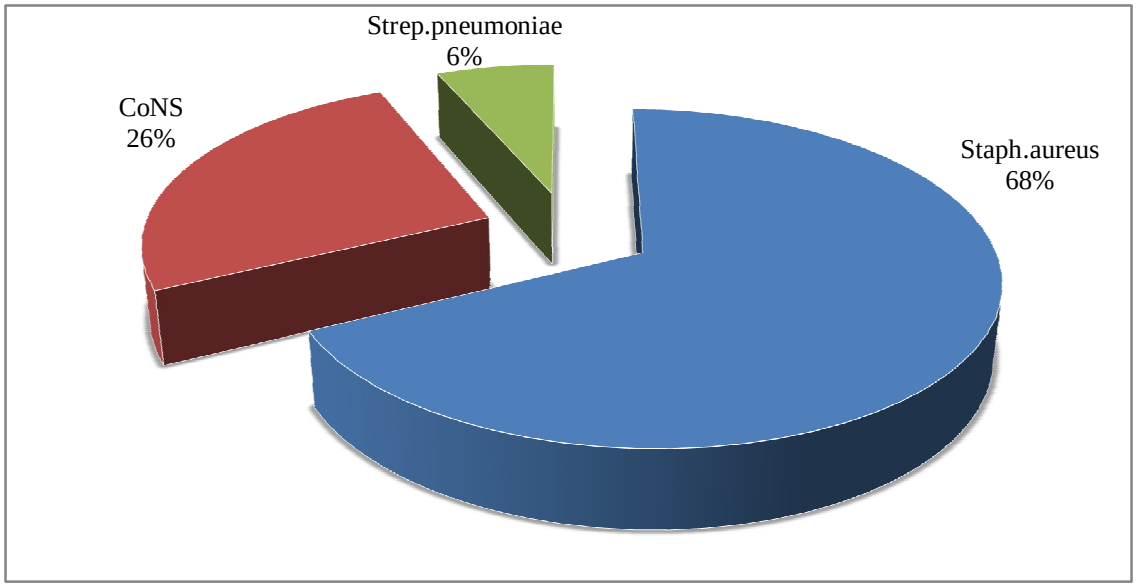


CHART 3: DISTRIBUTION OF CONJUNCTIVITIS CASES ACCORDING TO SPECTRUM OF GRAM NEGATIVE BACILLI.

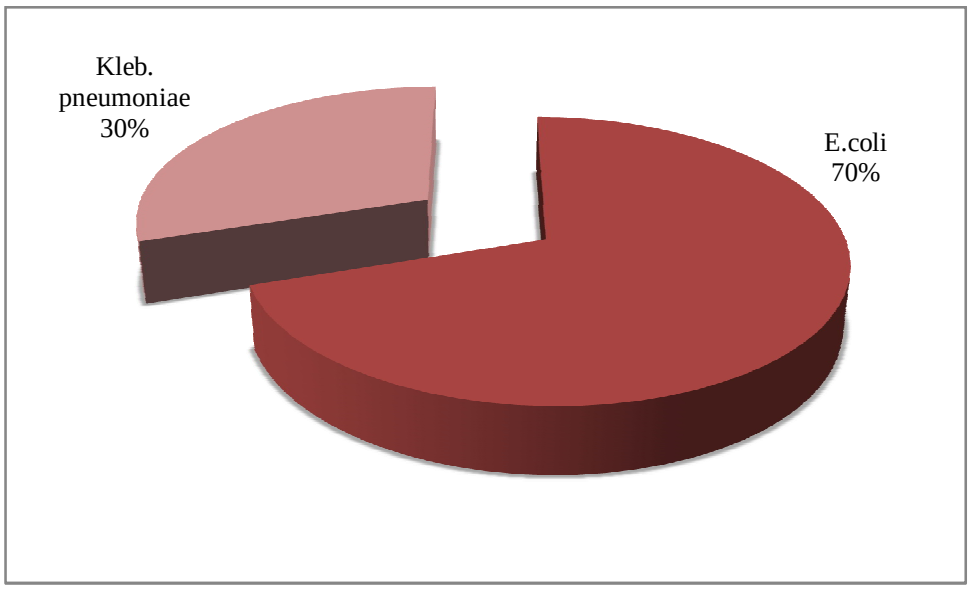
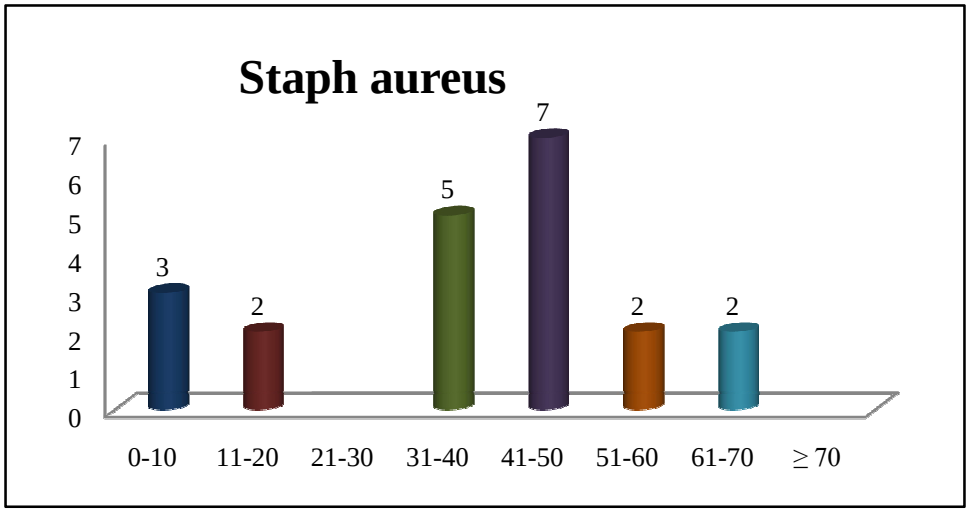
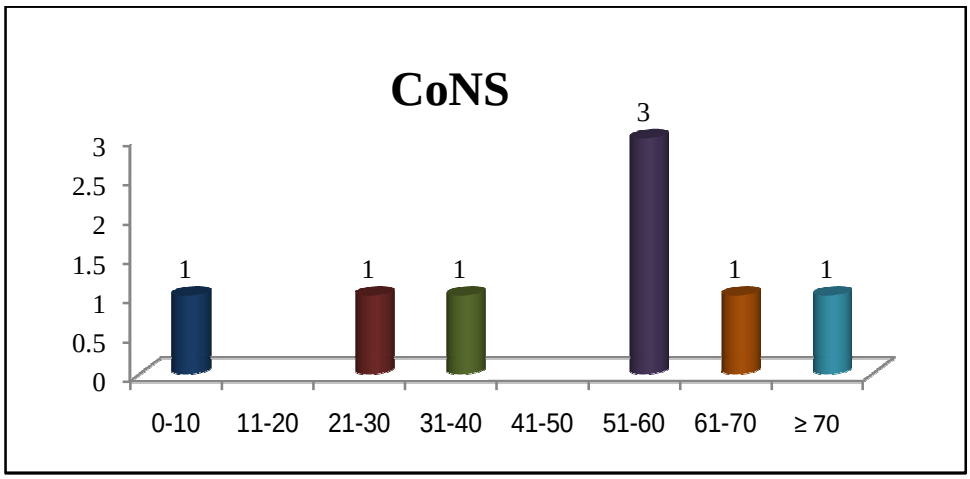


CHART 4:DISTRIBUTION OF GRAM POSITIVE COCCI AMONG VARIOUS AGE GROUPS IN CONJUNCTIVITIS





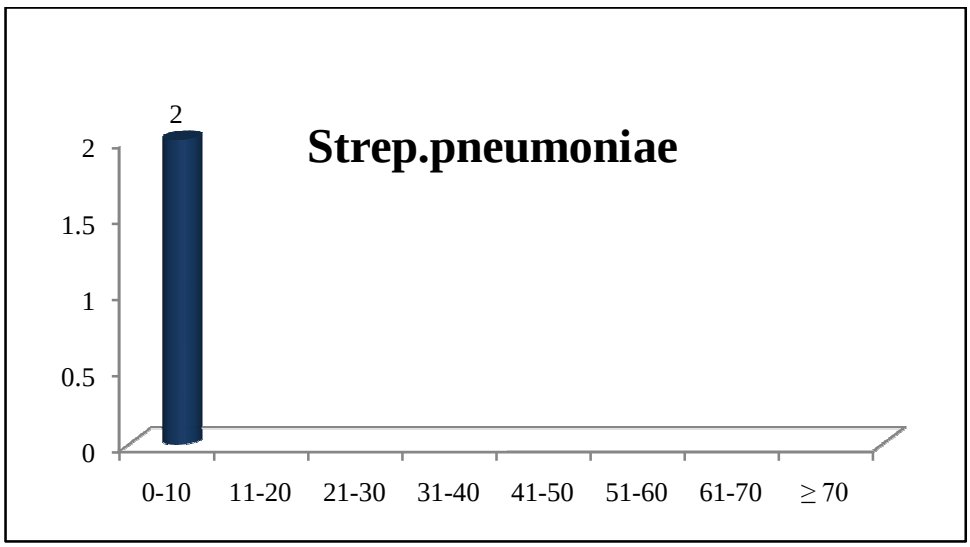
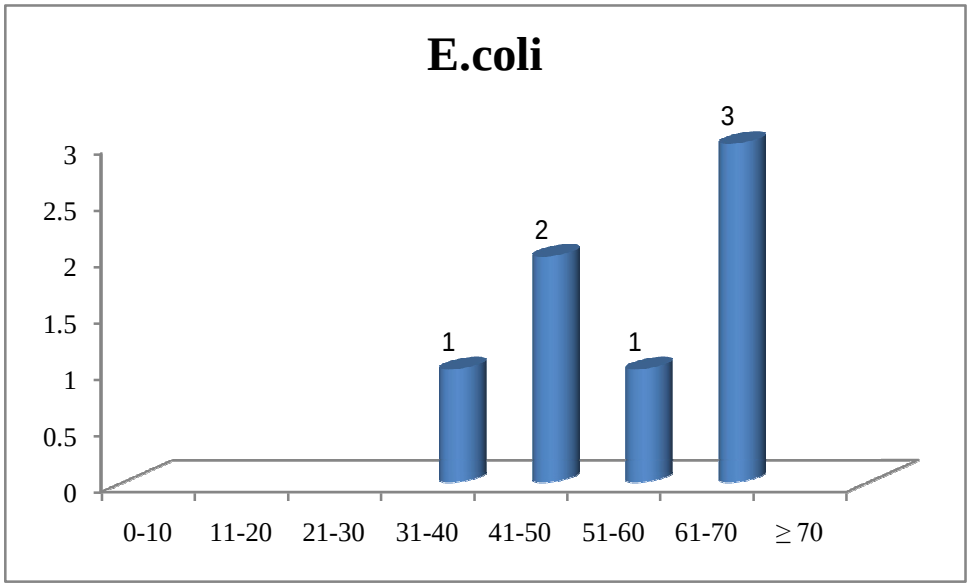


CHART 5: DISTRIBUTION OF GRAM NEGATIVE BACILLI AMONG VARIOUS AGE GROUPS IN CONJUNCTIVITIS



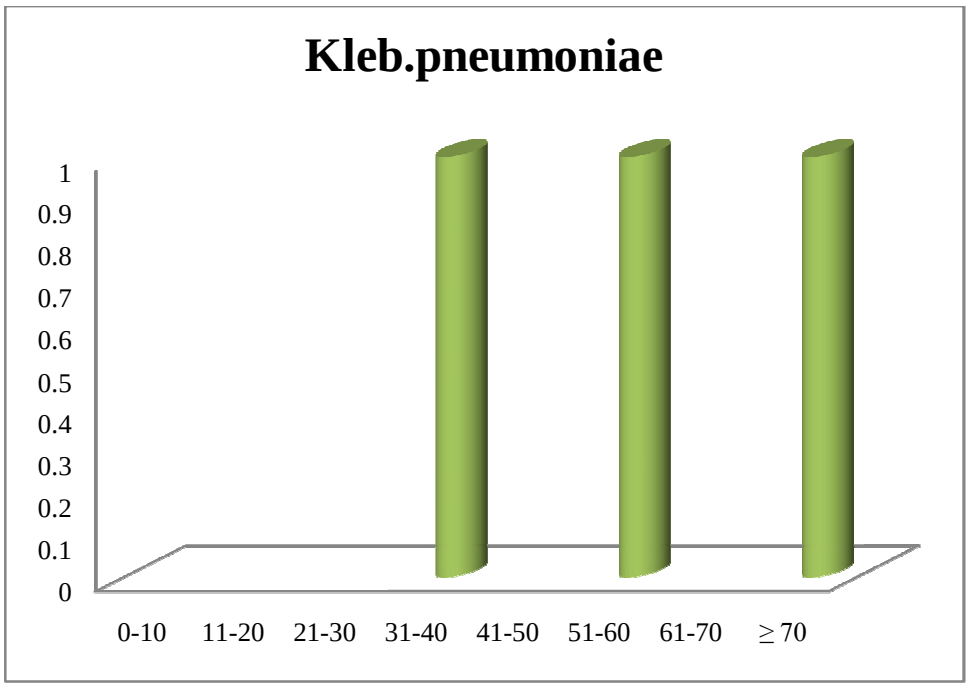


CHART 6: AGE AND SEXWISE DISTRIBUTION OF KERATITIS CASES

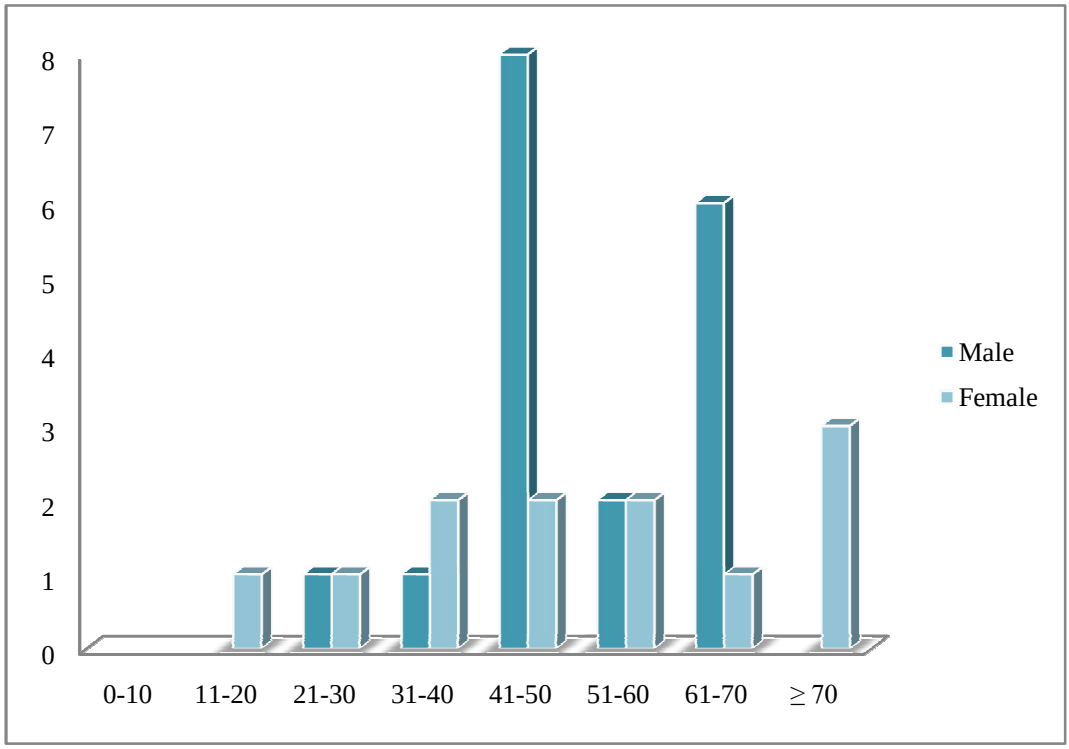


CHART 7: OCCUPATIONAL INCIDENCE OF KERATITIS CASES

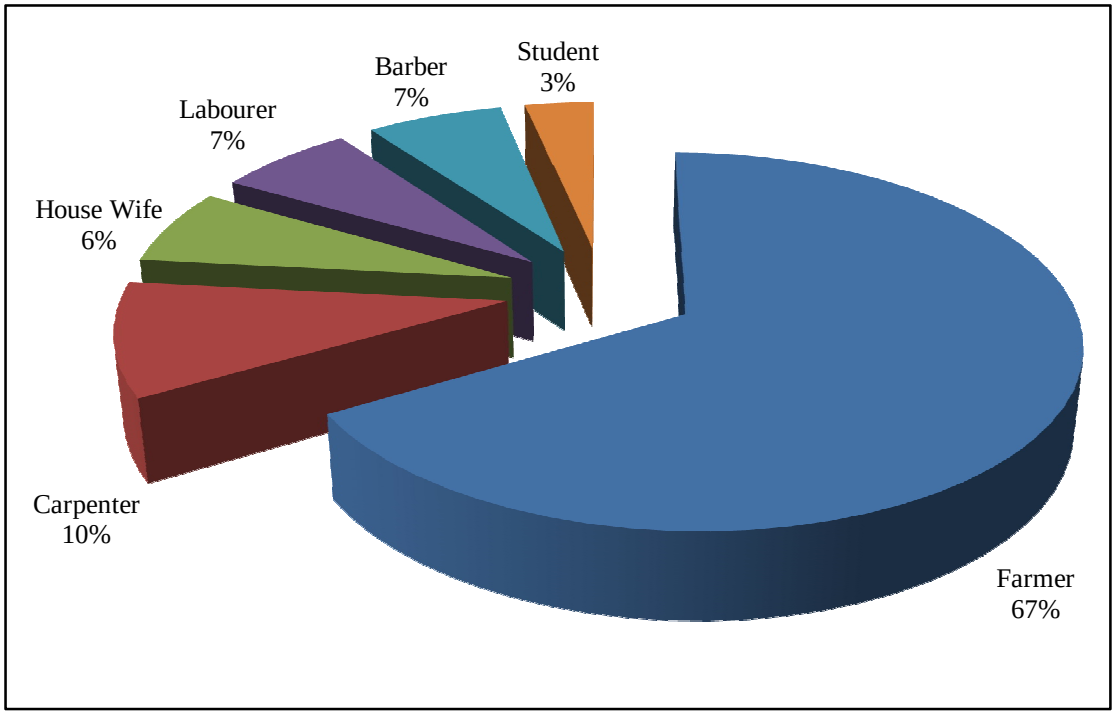


CHART 8: PREDISPOSING FACTORS IN KERATITIS CASES

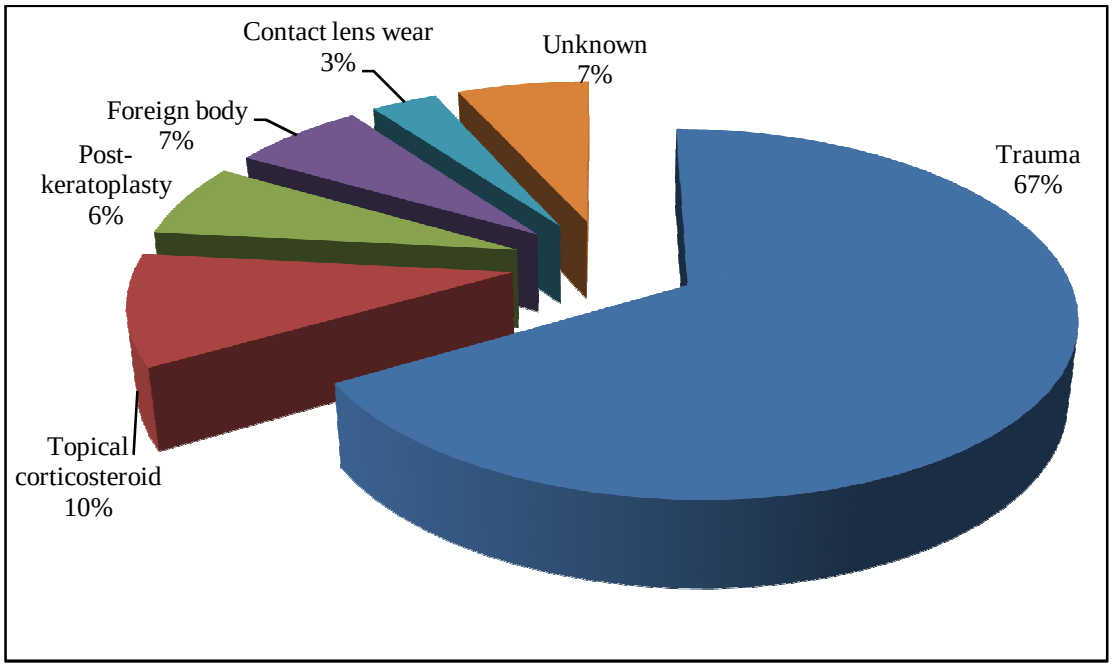


CHART 9: AGE AND SEXWISE DISTRIBUTION OF DACRYOCYSTITIS CASES

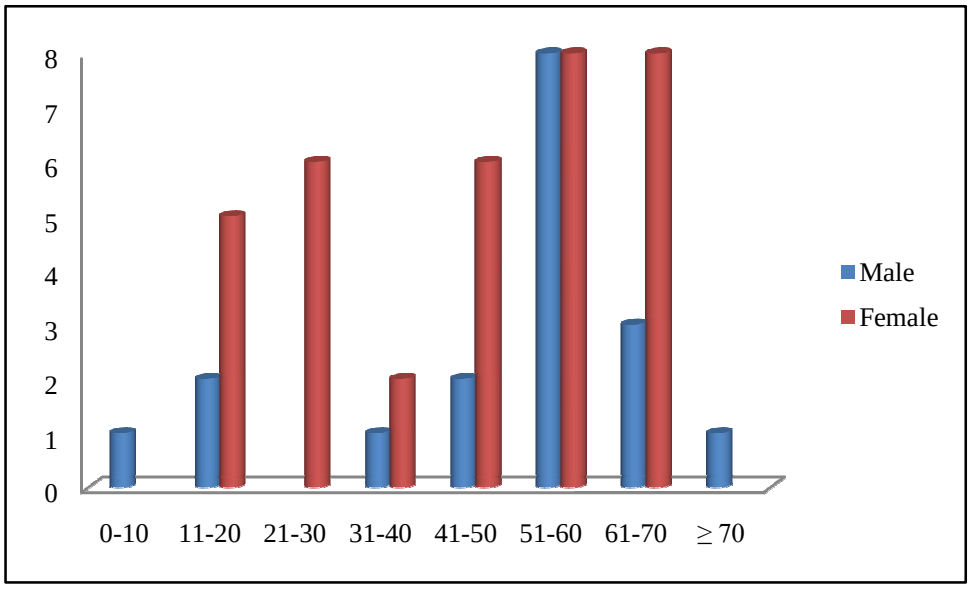


CHART 10: DISTRIBUTION OF GRAM POSITIVE ISOLATES IN DACRYOCYSTITIS CASES

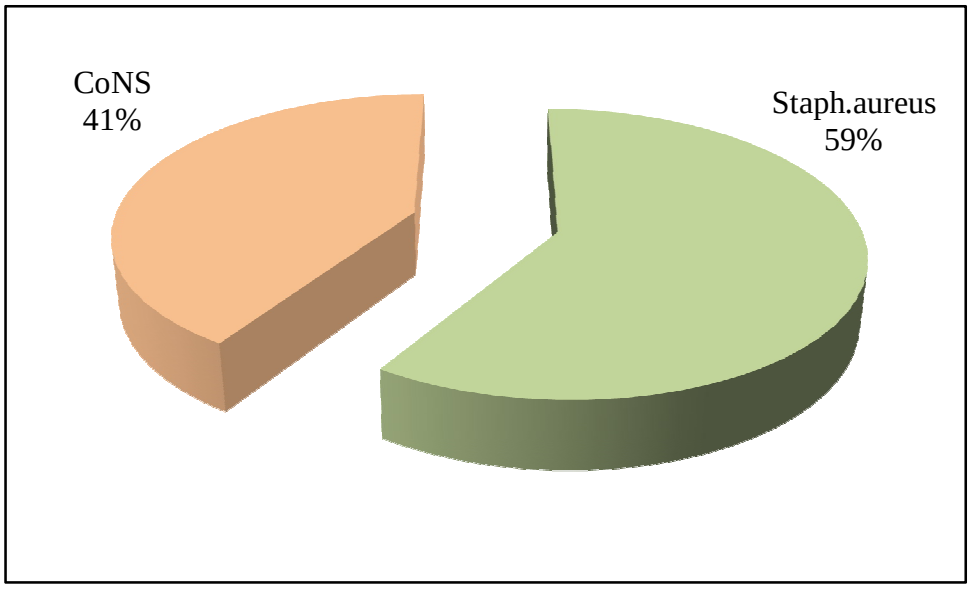


CHART 11: DISTRIBUTION OF GRAM NEGATIVE ISOLATES IN DACRYOCYSTITIS CASES

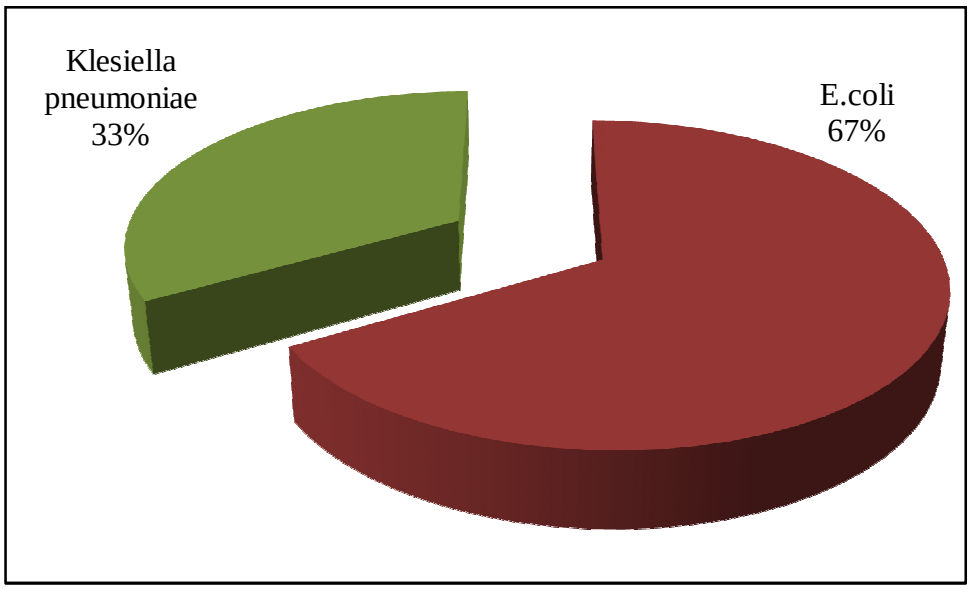


CHART 12: AGE AND SEX WISE DISTRIBUTION OF EYELID INFECTIONS

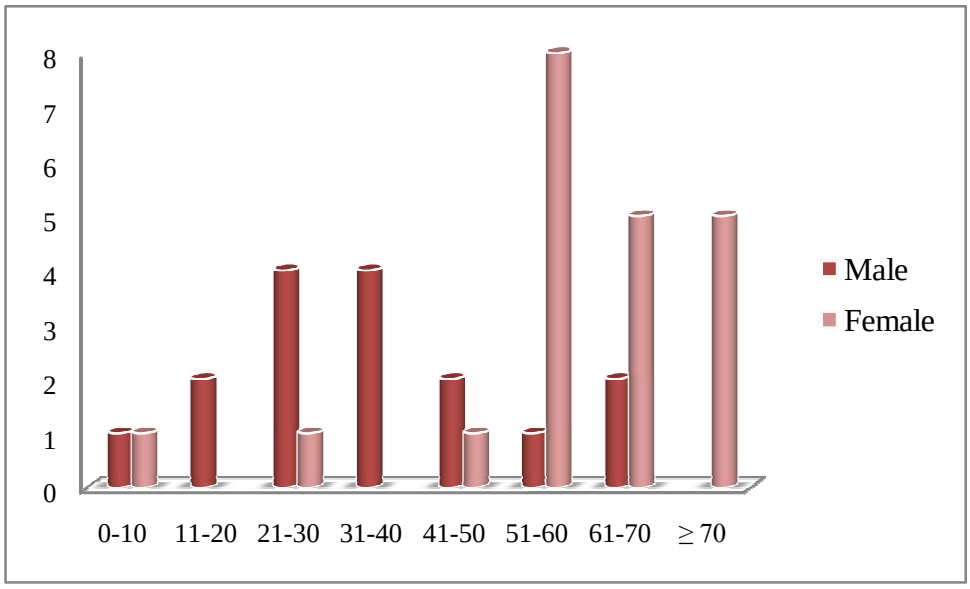
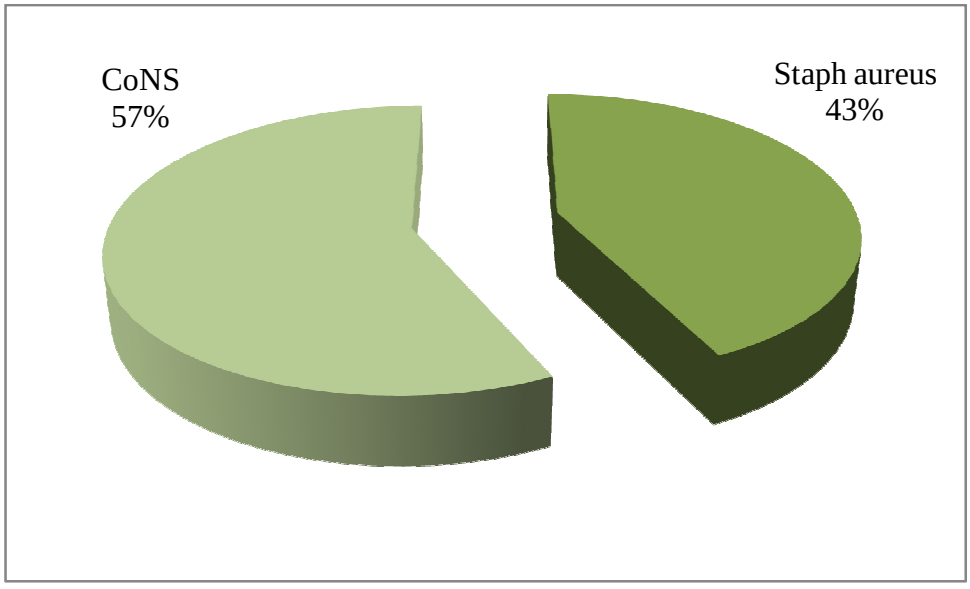


CHART 13: DISTRIBUTION OF ORGANISMS IN EYELID INFECTIONS



DISCUSSION

DISCUSSION

Among the total number of 222 ocular samples, 96 swabs were received from the conjunctivitis cases, 30 corneal scrapings from keratitis cases, 53 swabs from cases of lacrimal sac infections, 37 swabs from the eyelid infection cases and 6 intraocular samples from the postoperative endophthalmitis and panophthalmitis were obtained and subjected to microbiological evaluation during the study period of one year from August 2013 to July 2014.

The incidence of bacterial conjunctivitis in this study was 42.7%.This was in accordance with a study done by Agaba et al[58]., in 2014 from South Western Uganda , where the incidence rate was 44.4%. On the other hand in a study done by S.O. Samuel et al.,[59] from Nigeria in 2012, a higher incidence of 59.6% was reported.

The present study covers age group ranged from 1-86 yrs. The youngest was a 1 yr old male child and the eldest was an 86 yr old male. The commonest age group affected among the cases that yielded growth was 41- 50 yrs (21.9%) which was similar to the findings from a study reported by Agaba et al.,[58] . The increase in the number of cases in this age group may be due

to the fact that these persons are more commonly involved in outdoor activities.

In contrast to this, a study done by A.O.Okesola et al .,[60] in 2010 from Ibadan, showed that the bacterial conjunctivitis was more commonly diagnosed in children (newborn to under 3 yrs). In the present study, the next order of prevalence of conjunctivitis was 31-40 yrs(19.5%) followed by 51-60 yrs(17.1%) and 61-70 yrs (17.1%) respectively.

In this study females, 50(52.1%) were more commonly affected than males 46(47.9%) which was similar to studies reported by A.O Okesola et al.,[60] from Ibadan in 2010 and B.Carreras et al.,[61] in 2012. However in a study done by ,S.O.Samuel et al.,[59] from Nigeria in 2012 , a higher incidence of conjunctivitis was seen in males when compared to females.

Among the 41 isolated pathogens in conjunctivitis , gram positive cocci 31 (75.6%) were more commonly isolated than the gram negative bacilli 10 (24.4%).A study conducted by Ramesh et al.,[3] from South India in 2010, also showed that gram positive organisms were commoner than gram negative organisms in bacterial conjunctivitis.

Staph. aureus 21 (67.7%) was the commonest organism isolated among gram positive organisms in this study. Similar studies done by S.O. Samuel et al.[59], A.O.Okesola et al.,[60] and Alaa Zanzal et al.[62],in 2005 from Tikrit Hospital in Ibadan, have reported Staph.aureus as the commonest isolate in conjunctivitis. The second common isolate in this study was CoNS 8(25.8%). A study conducted by A.O. Okesola et al[60] from Ibadan also showed Coagulase negative Staphylococci as the second common isolate. The next organism isolated in this study was Strep.pneumoniae 2(6.5%). Studies conducted by S.O.Samuel et al.,[59] and Alaa Zanzal et al., [62] reported Strep.pneumoniae as the second common isolate in conjunctivitis. In our study, among the gram negative organisms, E.coli 7(70%) was the commonly isolated organism followed by Klebsiella pneumoniae 3(30%) whereas in a study by Dagnachew et al [67].,in 2014 from North west Ethiopia, Klebsiella pneumoniae was the commonest organism isolated among the gram negative organisms.

In this study, Staph.aureus was a common isolate in the age group of 0-50 yrs except in the age group of 21-30 yrs. A study by O.A.Adeyeba et al.,[63] from South west Nigeria in 2010 , reported that Staph.aureus was the commonest isolate in the age

group of 1-10 yrs. Similar study done in Tewelde et al.[2],in 2013,from South West Ethiopia have showed that Staph.aureus as the commonest isolate in the age group ≥ 20 yrs.

CoNS was commonly isolated in the age group of 21-30 yrs and 51-60 yrs. In contrast to this, a study done by Dagnachew et al .,[67] from North West Ethiopia in 2014 showed that CoNS was the frequent isolate in the age group less than 2 yrs.

In this study, Strep.pneumoniae was isolated only in 2 cases and was seen in the age group less than 3 yrs. This was in accordance to a study conducted by Tewelde et al.,[2] in South West Ethiopia where Strep.pneumoniae was isolated in the age group less than 3 yrs old.

In the present study, E.coli was commonly isolated in the age group of 61-70 yrs .This was in contrast to a study conducted by Dagnachew et al .,[67] in 2014 from Gondar Hospital, North west Ethiopia where E.coli was isolated in patients less than 2 yrs of age.

In this study, the antibiotic sensitivity of Staph. aureus showed maximum sensitivity to Vancomycin , Amikacin, Ciprofloxacin, Ofloxacin and Gentamycin .This was similar to a study done by Idu et al.,[64] in 2003 from Ibadan which showed that

Quinolones were more effective in the treatment of bacterial conjunctivitis infected with Staph.aureus. In a study done by O.A. Adeyeba et al.,[63] Gentamycin appeared as the most potent antibiotic followed by Ciprofloxacin.

In this study, Staph. aureus showed maximum resistance to Erythromycin and Chloramphenicol where the results were similar to a study done in by Tewelde et al.,[2] from South West Ethiopia. In a study by Sathapit et al[65] .,in 2011 from Kathmandu ,Chloramphenicol and Gentamycin were the most sensitive drugs in the treatment of conjunctivitis.

In the present study, CoNS was highly susceptibile to Ciprofloxacin ,Ofloxacin and Amikacin. Similar study by Ana Luisa et al.[66], in 2004, showed that Ciprofloxacin and Ofloxacin was highly effective in treatment of conjunctivitis infected with Coagulase Negative Staphylococci. CoNS showed high resistance to Chloramphenicol and Cotrimoxazole which was similar to a study done by Dagnachew et al.,[67] .

In the present study, Strep.pneumoniae showed high rate of susceptibility to Ciprofloxacin, Doxycycline,Erythromycin, Vancomycin and Chloramphenicol. Similar study done in by Tewelde et al.,[2]

South west Ethiopia reported the same. Strep.pneumoniae showed more resistance to Amikacin.

E.coli showed maximum sensitivity to Amikacin and Gentamycin which was similar to a study done by Mulla et al.,[68] in 2012 from India, et al., E.coli was highly resistant to Ceftriaxone and Cotrimoxazole and In our study showed Klebsiella pneumoniae was more sensitive to Amikacin, Ciprofloxacin and Ofloxacin . It showed maximum resistance to Doxycycline.

In Keratitis cases, Direct microscopy with 10% KOH mount and gram staining was performed for all received samples. LPCB mount was done for the isolates that showed filamentous growth. Slide culture was done for the selected isolates for confirmation of microscopic morphology. The antifungal susceptibility test was performed for the isolated fungi.

The age group in patients affected with keratitis in the present study ranged from 12-86 yrs. The youngest age group affected was 12 yrs old female and the oldest age group affected was 86 yr old male. The commonest age group affected in this study was 41-50 yrs (33.3%) which was similar to the findings in the study by Reddy et al.,[69] in India. The increase in cases among this age group in this study may be due to the reason that they

are more exposed to the environmental conditions. In the present study, the next order of prevalence was 61-70 yrs (23.3%) followed by 51-60 yrs (13.3%) and least affected were people aged more than 70 yrs.

In the present study, males 18(60.0%) were more commonly affected than females 12 (40.0%) which was similar to a study by Rumpa Saha et al.,[6]in 2005 from Delhi. The ratio between males and females in this study was 1.5:1.The high incidence of Keratomycosis in males may be due to the fact that most of the males were involved in outdoor activity.

Regarding the occupational incidence among keratitis patients, the majority of the patients were farmers 20 (66.6%) followed by carpenters 3(10.0%) ,house wives 2 (6.7%), labourers 2(6.7%) ,barbers 2(6.7%) and student 1(3.3%).This study was comparable with the study done by Chander et al.[38], from Chandigarh in 2008 where the most commonly affected people were agriculturists.

In our study the predisposing factors taken into consideration include trauma ,chronic topical corticosteroid application and foreign body in the eye ,contact lens wear and post keratoplasty cases.

The most common predisposing factors in our study was trauma 20 (66.6%) followed by chronic topical corticosteroid

therapy 3 (10%), post keratoplasty 2(6.7%) and foreign body in the eye 2(6.7%).Contact lens wear was identified as a risk factor in only one case in our study which lead to keratitis. There were two cases in the study where the predisposing factor was unidentified. This correlates well with the study by Hitesh et al .,[30] in 2010 from Gujarat.

The chronic topical corticosteroid usage accounted for 3(10%) of cases which was the second common predisposing factor in this study which was similar to a study conducted by Fadzillah Mohd-Tahir et al[39]., in 2011 from Malaysia. This may be due to the reason of over the counter availability of steroid eye drops in our country.

In this study, the sensitivity of KOH mount versus culture was 87.5% and it was slightly higher when compared to a study by Sharma et al,[75] where the sensitivity was 81.2%. In a study by Ramakrishnan et al, [76] the sensitivity of KOH mount was 99.3% which was higher when compared with our study. Hence ,KOH mount has a definite value in diagnosis of fungal keratitis.

In the present study, the most commonly isolated fungi was Fusarium sp. 6(75%) followed by Penicillium sp.2(25%). Similar studies conducted by M Srinivasan et al.,[40] from South India in

1994 and Das S et al.,[71] from India in 2014 had reported Fusarium as the most common fungal isolate in Keratitis. In a study by Usha et al.,[70] in 2006 from India, had showed Aspergillus sp. as the most commonly isolated fungi in Keratomycosis.

The antifungal susceptibility pattern of Fusarium tested for Amphotericin B showed that the MIC 50 was 0.25 µg/ml. And MIC 90 was 2µg/ml and was susceptible. This was comparable to a study done by Lixin et al,[77] from China in 2006 where the MIC values of Amphotericin B for Fusarium was MIC 50 =1µg/ml and MIC =90 was 2µg/ml. In a study done by Alastruey et al,[78] in 2007, Amphotericin B was the only drug that showed in vitro activity against Fusarium (MIC≤2µg/ml.)

The MIC values for Voriconazole was MIC 50= 2µg/ml and MIC 90= 4µg/ml and which showed susceptibility to Fusarium. In a study by Pranab et al,[79] Fusarium isolates was susceptible to Voriconazole with MIC =8µmg/ml. In a study by Lalitha et al,[80] Voriconazole showed lower MIC values against Fusarium.

The MIC values of Natamycin was MIC 50=2µg/ml and MIC 90=8µg/ml. and showed susceptibility to Fusarium. MIC 90 =8µg/ml of Natamycin was obtained in our study was slightly

higher compared to a study by Lalitha et al,[81] where MIC 90=4µg/ml.

The MIC value obtained for Fluconazole was MIC 50=64µg/ml and it was resistant to Fusarium. These findings was similar to a study by Lixin et al, [77] where Fuconazole showed resistance to Fusarium.(MIC 50=32µg/ml, MIC 90 =64µg/ml.).In a study by Devarshi et al,[82] the MIC of Fluconazole was $\geq$ 32µg/ml.

The antifungal susceptibility pattern of Penicillium spp. showed that the MIC value obtained for Amphotericin B (MIC 50=0.5µg/ml and MIC 90=4µg/ml) and showed susceptibility to Penicillium.This was similar to a study done by Mitesh et al [83],in 2010 which showed Amphotericin B was active against Penicillium spp .In a study by Sabatelli et al[84], MIC 50 and MIC 90 of Amphotericin for Penicillium was 0.5 and 4µg/ml respectively which was similar to our study.

In our study,Fluconazole (MIC 50=64µg/ml) was resistant to Penicillium whereas in a study by Mitesh et al,[83] Fluconazole was a sensitive drug to Penicillium. In a study by Sabatelli et al ,[84]Fluconazole MIC 50 was 256µg/ml and showed resistant to Penicillium.

The MIC 50 and MIC 90 for Voriconazole was 1µg/ml and 2µg /ml respectively and was sensitive to Penicillium.

In the present study, 53 clinically diagnosed cases of Dacryocystitis of all ages and both sexes were studied. Our study showed an incidence rate of 52.8% which was comparable with a study by Mandal et al .,[46] in 2008 from India.

The age group ranged from 3-yrs to 86 yrs. The highest occurence was in the age group of 51-60 yrs.(30.2%). Similar study done by Khevna et al.,[72] from Sudan in 2014 had reported that occurrence of Dacryocystitis was common in this age group. A study by Chaudary et al.,[73] from Nepal in 2010 reported that infection was higher in the age group above 31 yrs.

The present study showed that females 35 (66.0%) were more commonly affected than males 8 (34.0%). This was similar to the studies conducted by Madhusudhan et al.,[45] in 2012 from Malaysia and Khevna Patelet al.,[72] in 2014 from Sudan. The predilection in females may be due to the smaller diameter of the naso lacrimal canal diameter in females than males.

The gram positive organisms 22(78.6%) were more commonly isolated than gram negative organisms 6(21.4%) in this study.This correlated well with the studies conducted by Mandal et al.,[46] and

Madhusudan et al.,[45] Staph aureus 13(59.1%) was the commonest isolate in this study followed by CoNS 9(40.9%) which correlated with the study done by C.P.Shah et al.,[74] in 2011 from Nepal.

Among the Gram negative organism, E.coli 4(66.7%) was the predominant isolate followed by Klebsiella pneumoniae 2(33.3%) that correlated well with the study by Khevna et al.,[72]

The antibiotic sensitivity pattern of Staph aureus showed high susceptibility to Vancomycin which was similar to a study by Prakash et al.,[47] in 2012 from India.The sensitivity of Staph . aureus to Ciprofloxacin was also high which resembled in a study by Khevna et al., [72]The other drugs that showed high susceptibility were Chloramphenicol, Amoxyclavulanic acid, Gentamycin and Ofloxacin. The maximum resistance was exhibited towards Amikacin and Ceftriaxone.

In our study CoNS was highly susceptible to Chloramphenicol which correlated with a study by Chaudary et al.,[73] in 2010 from Nepal. The other drugs which showed maximum sensitivity was Ofloxacin,Vancomycin, Doxycycline and Erythromycin. The maximum resistance was to Cotrimoxazole and Ceftriaxone.

E.coli was highly susceptible to Amikacin, Gentamycin and Chloramphenicol whereas maximum resistance was against

Ofloxacin,Doxycycline and Cotrimoxazole.In the present study, Klebsiella pneumoniae was most sensitive to Amikacin,Gentamycin , Ofloxacin and Ceftriaxone . Klebsiella pneumoniae was resistant to Doxycycline , Chloramphenicol and Cotrimoxazole.

In the present study , the incidence was (56.8%) among eyelid infection cases.The most common age group affected was 51-60 yrs.(24.3%).Females 21 (56.8%) were more commonly affected than males 16(43.2%).Among the 21 positive cases ,CoNS 12 (57.1%) was more often isolated than Staph.aureus 9(42.9%).This was comparable to the study by Parima et al.,[54] in 2012 where CoNS was the most common isolate followed by Staph.aureus. In a study by Udo et al., [54] Staph. aureus was the common isolate in eyelid infections followed by CoNS.

The antibiotic susceptibility of staph.aureus showed maximum susceptibility to Vancomycin, Ofloxacin and Doxycycline. CoNS was maximum susceptible to Vancomycin and Doxycycline and maximum resistance towards Erythromycin and Chloramphenicol.

Six samples of intraocular fluids were received from post operative endophthalmitis patients.The samples received were 5 vitreous samples and 1 aqueous sample. The patients were already

on treatment with topical and systemic antibiotics and the visual outcome was deteriorating inspite of the treatment. The samples were collected for microbiological evaluation to find out the organism. Direct microscopy with gram staining was performed for these samples and then culture was performed. However ,the results of direct microscopy by gram staining and culture was negative. However in most cases of endophthalmitis ,organisms cannot be detected by culture.[50]

SUMMARY

SUMMARY

A total of 222 ocular samples were received and subjected for microbiological examination over a period of one year from August 2013 to July 2014 at Department of Microbiology, Coimbatore Medical College Hospital,Coimbatore.

- The incidence of bacterial conjunctivitis was 42.7%.
- The most commonly affected age group in conjunctivitis that yielded growth was 41-50 yrs (21.9%).
- Females (52.1%) were more commonly affected than males (47.9%).
- The gram positive cocci (75.6%) was most commonly isolated followed by gram negative bacilli (24.4%).
- Staph.aureus (67.7%) was the most common organism isolated among the gram positive cocci followed by CoNS (25.8%) and Strep.pneumoniae (6.5%).
- E.coli (7.0%) was the most common gram negative bacilli followed by Klebsiella pneumoniae (30.0%).
- Staph.aureus was the commonest isolate in age group of 0-50 yrs except in 21-30 yrs.
- CoNS was the commonest isolate in the age group of 21-30 yrsand 51-60 yrs.

- Strep.pneumoniae was isolated in the age group less than 3 yrs.
- In the age group of 61-70 yrs ,E.coli was the most frequently isolated organism.
- Staph.aureus was most sensitive to Vancomycin, Amikacin, Ciprofloxacin, Ofloxacin and Gentamycin and resistant to Chloramphenicol and Erythromycin.
- CoNS showed maximum sensitivity to Ciprofloxacin, Ofloxacin, Amikacin and resistant to Chloramphenicol and Cotrimoxazole.
- Strep.pneumoniae showed maximum sensitivity to Ciprofloxacin, Doxycycline, Erythromycin, Vancomycin and Chloramphenicol and resistant to Amikacin.
- E.coli showed higher rate of susceptibility to Amikacin and Gentamycin and resistance was shown to Ceftriaxone and Cotrimoxazole.
- Klebsiella pneumoniae was most sensitive to Amikacin, Ciprofloxacin and Ofloxacin and resistance was shown to Doxycycline.
- In keratitis cases ,the commonest age group affected was 41-50 yrs (33.3%).

- Males (60.0%) were more commonly involved than Females (40.0%).
- Occupationally, Farmers (66.6%) were more commonly involved followed by carpenters (10.0%),Housewives (6.7%), labourers(6.7%), Barbers(6.7%) and Student (3.3%).
- Trauma (66.6%) was the most common predisposing factor followed by chronic topical corticosteroid usage (10.0%), post keratoplasty (6.7%), foreign body (6.7%), contact lens wear (3.3%) and unknown (6.7%).
- KOH mount had a sensitivity of 87.5% and showed a greater diagnostic value in patients with keratomycosis.
- Fusarium spp. (75.0%) was the most commonly isolated fungi followed by Penicillium spp. (25.0%).
- The antifungal susceptibility testing by Microbroth dilution method showed Amphotericin B , Voriconazole and Natamycin were the most sensitive antifungal drugs against Fusarium spp.
- Amphotericin B and Voriconazole were the antifungal drugs that showed susceptibility against Penicillium spp.
- In Dacryocystitis cases, the incidence rate was 52.8%.
- The most common age group affected was 51-60 yrs.(30.2%).

- Females(66.0%) were more commonly affected than Males (34.0%).
- The gram positive cocci (78.6%) was most commonly isolated followed by gram negative bacilli (21.4%).
- Staph. aureus(59.1%) was the most common gram positive cocci isolated followed by CoNS (40.9%).
- The gram negative bacilli most frequently isolated was E.coli (66.7%) followed by Klebsiella pneumoniae (33.3%).
- Staph. aureus was the commonest isolate in the age group of 51-60 yrs and 61-70 yrs.
- CoNS was commonly isolated in the age group of 11-20 yrs and 41-50 yrs.
- Among the gram negative bacilli, E.coli was isolated in the age group of 21-60 yrs.
- Klebsiella pneumoniae was isolated in the age group of 51-60 yrs and 61-70 yrs.
- Staph. aureus showed maximum sensitivity to Vancomycin, Chloramphenicol, Amoxy clavulanic acid, Gentamycin, Ofloxacin and resistant to Amikacin and Ceftriaxone.

- CoNS showed high susceptibility to Ofloxacin, Chloramphenicol and Vancomycin and resistance to Cotrimoxazole and Ceftriaxone.
- E.coli was maximally sensitive to Amikacin, Gentamycin and Chloramphenicol and resistant to Ofloxacin, Doxycycline and Cotrimoxazole.
- Klebsiella pneumoniae was highly sensitive to Amikacin, Gentamycin, Ofloxacin andCeftriaxone and resistant to Doxycycline, Chloramphenicol and Cotrimoxazole.
- In case of eyelid infections, the incidence rate was 56.8%.
- The most common age group affected was 51-60 yrs.(24.3%).
- Females (56.85) were more commonly involved than Males (43.2%).
- CoNS (57.1%) was the commonest isolate followed by Staph.aureus (42.9%).
- CoNS showed maximum susceptible to Vancomycin, Doxycycline, Ciprofloxacin and Ofloxacin and resistance to Erythromycin and Chloramphenicol.
- Staph. aureus was most sensitive to Ofloxacin, Vancomycin and Doxycycline.

CONCLUSION

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Ocular infections are one of the commonest infections in our country due to virtue of subtropical climate. The anterior part of the eye is infected by direct invasion by the anterior route while the blood borne infections may reach the posterior segment of the eye. Even a minor infection elsewhere in the body may be fatal to the eye in terms of visual compromise.

Bacterial conjunctivitis is common in children and adults and although most cases are self limited appropriate antimicrobial treatment accelerates resolution and reduces complications. In our study, Gram positive organisms are the most common causative agents of bacterial conjunctivitis and antibiotics like Gentamycin and quinolones like Ciprofloxacin and Ofloxacin are effective in their treatment. Unfortunately, antibiotic resistance is increasing in outpatients and susceptibility of the most ocular pathogens to ocular antibiotic agents has reduced drastically..

In the hospital ,the organisms and their resistance pattern are more varied and hence culturing the conjunctiva before starting the therapy is warranted.

Mycotic keratitis is an important cause of ocular morbidity mostly in persons inhabiting rural areas involved in outdoor agricultural activities.Young male adults affected in these circumstances are often the bread earners of the family and blindness in them is of serious consequences. In our study, majority of corneal ulcers are due to Fusarium spp. which is one of the most virulent ocular pathogens that underscores the need for more effective methods of diagnosis and treatment to reduce the burden of avoidable blindness.

KOH mount has a definite place in diagnosis of Keratomycosis and hence meticulous examination of corneal scrapings by KOH mount and early institution of antifungal therapy may limit the ocular morbidity.

The microbiological diagnosis of endophthalmitis is based on microscopy and culture of the organism from the intraocular fluids. Despite best microbiological techniques and immediate processing of the samples, the sensitivity of the conventional methods in detecting the organisms in intraocular fluids is low. Highly sensitive techniques like real time PCR has an extraordinary dimension in diagnosis of intraocular infections.

Dacryocystitis and Eyelid infections are one among the predisposing factors for post operative endophthalmitis and knowledge of common bacteria and their antibiotic sensitivity may help in deciding the appropriate antibiotic coverage for patients undergoing ocular surgery. It is therefore important in culturing the samples in patients with these infections and to start on appropriate antibiotic treatment to prevent emergence of resistant strains.

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ANNEXURES

LIST OF TABLES

LIST OF CHARTS

LIST OF COLOUR PLATES

S.No.	Name of the colour plate
1.	Nutrient Agar plate showing Staphylococcus aureus.
2.	Blood Agar plate showing Staphylococcus aureus.
3.	Mueller Hinton Agar plate showing Staphylococcus aureus.
4.	Mac Conkey Agar plate showing Klebsiella pneumoniae.
5.	Blood Agar plate showing Klebsiella pneumoniae.
6.	Microscopy (10% KOH Mount) showing septate hyphae.
7.	Gram stain showing septate hyphae.
8.	Fusarium spp.- Obverse view.
9.	Fusarium spp.- Reverse view.
10.	LPCB Mount- Fusarium spp. showing Macroconidia.
11.	Penicillium spp .- Obverse view.
12.	Penicillium spp .- Reverse view.
13.	LPCB Mount- Penicillium spp.
14.	Antifungal susceptibility pattern of Penicillium.
15.	Antifungal susceptibility pattern of Fusarium.

LIST OF ABBREVIATIONS

Ig A	- Immunoglobulin A
Ig G	- Immunoglobulin G
Staph aureus	- Staphylococcus aureus
CoNS	- Coagulase Negative Staphylococci
E.coli	- Escherichia coli
Kleb pneumonia	- Klebsiella pneumoniae
H.influenzae	- Haemophilus influenzae
Strep pneumoniae	- Streptococcus pneumoniae
KOH Mount	- Pottasium Hydroxide Mount
SDA	- Sabourauds Dextrose Agar
LPCB	- Lactophenol Cotton Blue Mount
CLSI	- Clinical and Laboratory Standards Institute
DMSO	- Dimethyl sulfoxide
PPV	- Positive predictive value
NPV	- Negative predictive value
MIC	- Minimum Inhibitory Concentration.

PROFORMA

NAME:-

AGE:- **OP/IPNO:-**

SEX:-*MALE /FEMALE* ***DATE OF ADMISSION:- / /201***

ADDRESS:- *URBAN /RURAL* ***DATE OF SPECIMEN COLLECTION:- / /201***

OCCUPATION:-

DIAGNOSIS:-

SPECIMEN:-

HISTORY:-

- ⇨ *TRAUMA / FB /CONTACT LENSE USAGE /TOPICAL CORTICOSTEROIDS /HERBAL MEDICINES*
- ⇨ *DM / HT / IMMUNO COMPROMISED PT/ PREVIOUS SURGERY (CATARACT/KERATOPLASTY)*

DIRECT MICROSCOPY:

KOH MOUNT	GRAMS STAIN

CULTURE: ***SDA***

DATE OF INOCULATION:

	SDA 1(R T)		***SDA 2 (37*C)***	
	MACROSCOPY	MICROSCOPY	MACROSCOPY	MICROSCOPY
DAY 1	O			
	R			
DAY 2	O			
	R			
DAY 3	O			
	R			
1ST WEEK	O			
	R			
2ND WEEK	O			
	R			
3RD WEEK	O			
	R			

BAP:-

CAP:-

MAC:-

BIOCHEMICAL REACTIONS:

DIAGNOSIS:

ANTIBIOTIC PATTERN:

MASTER CHART

S.No	Name	Age	Sex	Occupation	Specimen	Diagnosis	Organism	Sensitive	Resistant
1	Palaniammal	65 yrs	F	Agriculture	RE Conjunctival swab	RE Conjunctivitis	CONS	Ak,G,Do,E,Ctr,Van,	Cip,Of,Chl,Cot
2	Lakshmi	60 yrs	F	Agriculture	LE Conjunctival swab	LE Conjunctivitis	Staph.aureus	Ak,Van,Ctr,G,Chl	Cip,Do,E,Of,Cot
3	Krishnaveni	44 yrs	F		RE Conjunctival swab	RE Conjunctivitis	Staph.aureus	Ak,Cip,Of,Van,Do,Ctr	G,E,Cot,Chl,
4	Sabiya Begum	60 yrs	F		LE Conjunctival swab	LE Conjunctivitis			
5	Rangan	65 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
6	Iruthayanathan	51 yrs	M		LE Conjunctival swab	LE Conjunctivitis	Staph.aureus	Ak,Cip,Of,Van,Do,E	Cot,Chl,G,Ctr
7	Nanjammal	63 yrs	F		LE Conjunctival swab	LE Conjunctivitis			
8	Sadam Hussain	14 yrs	M		LE Conjunctival swab	LE Conjunctivitis			
9	Reshma	14 yrs	F		RE Conjunctival swab	RE Conjunctivitis			
10	Kumar	40 yrs	M		LE Conjunctival swab	LE Conjunctivitis			
11	Meenakshiammal	67 yrs	F		LE Conjunctival swab	LE Conjunctivitis			
12	Kamala	75 Yrs	F		RE Conjunctival swab	RE Conjunctivitis			
13	Javid	24 Yrrs	M		RE Conjunctival swab	RE Conjunctivitis			
14	Sankumari	64 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
15	Palanisamy	42yrs	M		LE Conjunctival swab	LE Conjunctivitis			
16	Ummar Sheriff	34 yrs	M		RE Conjunctival swab	RE Conjunctivitis	Staph.aureus	Ak,Van,Do,Ctr	E,G,Cip,Of,Cot,Chl
17	Prajeena	9 yrs	Fch		RE Conjunctival swab	RE Conjunctivitis	Staph.aureus	Ak,Van,E,Chl,Of,Cot	Ctr,Cip,Do,G
18	Sowmya	9 yrs	Fch		RE Conjunctival swab	RE Conjunctivitis	Staph.aureus	Ak,Van,Of,Cot,G	Ctr,Cip,Do,E,Chl
19	Shanthi	50 yrs	F	Agriculture	RE Conjunctival swab	RE Conjunctivitis	Staph.aureus	Ak,Cip,Do,Cot,Of,Van	G,Ctr,Chl,E
20	Ammasaiyammal	54 yrs	F		LE Conjunctival swab	LE Conjunctivitis			
21	Aiysha	60 yrs	F		RE Conjunctival swab	RE Conjunctivitis	CONS	Ak,G,Do,E,Ctr,Van,Cip,Cot	Of,Chl
22	Deepa	32 yrs	F		LE Conjunctival swab	LE Conjunctivitis			
23	Shanmugan	50 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
24	Balakrishnan	43 yrs	M		LE Conjunctival swab	LE Conjunctivitis			
25	Annaparvathy	33 yrs	F		LE Conjunctival swab	LE Conjunctivitis	CONS	Ak,Do,Van,Of,Cot,Chl	G,E,Ctr,Cip,
26	Palanisamy	65 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
27	Banu	30 yrs	F		RE Conjunctival swab	RE Conjunctivitis			
28	Ilfa	1 yr	Fch		LE Conjunctival swab	LE Conjunctivitis	Strep pneumo	Ak,G, Cip,Of,E	Cot,Chl,Ctr
29	Monisha	6 yrs	Fch		RE Conjunctival swab	RE Conjunctivitis			
30	Mini	40 yrs	F		RE Conjunctival swab	RE Conjunctivitis	Staph.aureus	Ak,G,Do,Cot,Cip,Of,Van	E,Chl,Ctr
31	Devadas	34 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
32	Ummar Sheriff	34 yrs	M		RE Conjunctival swab	RE Conjunctivitis	E. coli	Ak,Ctr,Chl,E	G,Cip,of,Cot
33	Apsara	3 yrs	Fch		LE Conjunctival swab	LE Conjunctivitis	Staph aureus	Ak,Do,Van,E,Of,Cip,Cot	CTR,G,Chl
34	Sabir	7 yrs	Fch		RE Conjunctival swab	RE Conjunctivitis			
35	Jeyaraj	47 Yrs	M		RE Conjunctival swab	RE Conjunctivitis	E. coli	Ak,Ctr,Do	G,Cip,of,Cot,Chl
36	Rathinam	55 Yrs	F		RE Conjunctival swab	RE Conjunctivitis	CONS	Ak,G,Cot,Cip,E,Chl	Do,Van,Of,Ctr
37	Ijas	7 yrs	Fch		LE Conjunctival swab	LE Conjunctivitis			

38	Ayyammal	55 yrs	F		RE Conjunctival swab	RE Conjunctivitis	Klebsiella	Ak,Cip,Of,Ctr	G,Cot,Chl
39	Rakamuthu	52 yrs	F		RE Conjunctival swab	RE Conjunctivitis	E. coli	of,Chl	Ak,G,Cot,Ctr,Cip
40	Karthik	13 yrs	Mch		LE Conjunctival swab	LE Conjunctivitis			
41	Murugan	36 yrs	M		LE Conjunctival swab	LE Conjunctivitis			
42	Pappammal	80 yrs	F		RE Conjunctival swab	RE Conjunctivitis			
43	Natarajan	64 yrs	M		RE Conjunctival swab	RE Conjunctivitis	E. coli	Ak,Ctr,Chl,Do	Cip,Of,Cot,G
44	Veerarangan	55 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
45	Chinnakali	74 Yrs	M		LE Conjunctival swab	LE Conjunctivitis			
46	Doniyal	9 yrs	Mch		RE Conjunctival swab	RE Conjunctivitis	CONS	Ak,Cip,Do,Cot,Of,E	G,ctr,Van,Chl
47	Paramasivam	36 yrs	M		RE Conjunctival swab	RE Conjunctivitis	Klebsiella	Ak,Cip,Of,ctr	G,Chl,Cot,Do
48	Ananda Kumar	2 yrs	Mch		RE Conjunctival swab	RE Conjunctivitis	Strep pneum	Ak,G, Cip,Of,E,Do	Cot,Chl,Ctr
49	Sadia Bose	51 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
50	Karthik	3 yrs	Mch		RE Conjunctival swab	RE Conjunctivitis			
51	Logambal	21 yrs	F		RE Conjunctival swab	RE Conjunctivitis	CONS	Ak,Van,Ctr,G,Chl,Of	Cip,Do,E,Ctr
52	Rahamath Nisha	46 yrs	F		LE Conjunctival swab	LE Conjunctivitis	Staph aureus	Ak,G,Do,E,Ctr,Van	Cip,Of,Cot,Chl
53	Thirumoorthy	50 yrs	M		LE Conjunctival swab	LE Conjunctivitis	Staph aureus	Ak,Cip,Do,Cot,Van,Of	G,Ctr,E,Chl
54	Veeramani	26 yrs	M		LE Conjunctival swab	LE Conjunctivitis			
55	Jagathisan	60 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
56	Aravind	14 yrs	M		LE Conjunctival swab	LE Conjunctivitis	Staph aureus	Ak,Cip,Do,Cot,Van,Of	G,Ctr,E,Chl
57	Adithyan	11 Yrs	Mch		LE Conjunctival swab	LE Conjunctivitis			
58	Fajurudeen	10 Yrs	Mch		RE Conjunctival swab	RE Conjunctivitis			
59	Barani	47 yrs	M		LE Conjunctival swab	LE Conjunctivitis			
60	Kali	65 Yrs	F		LE Conjunctival swab	LE Conjunctivitis			
61	Rajammal	62 yrs	F		RE Conjunctival swab	RE Conjunctivitis	E. coli	Ak,Ctr,Chl	G,Cot,Cip,Of,Do
62	Lakshmi	65 yrs	F		LE Conjunctival swab	LE Conjunctivitis			
63	Sivalingam	80 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
64	Karuppammal	80 yrs	F		LE Conjunctival swab	LE Conjunctivitis			
65	Chandra	65 yrs	F		RE Conjunctival swab	RE Conjunctivitis	Staph aureus	Ak,Cip,Do,Cot,Van,Of	G,Ctr,E,Chl
66	Kannammal	55 Yrs	F		LE Conjunctival swab	LE Conjunctivitis			
67	Chellamuthu	59 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
68	Rajamani	46 yrs	F		LE Conjunctival swab	LE Conjunctivitis	Staph.aureus	Ak,Van,Do,E,ctr,Of,Chl	Cot,G,Cip
69	Parvathy	65 yrs	F		RE Conjunctival swab	RE Conjunctivitis			
70	Divya	29 yrs	f		LE Conjunctival swab	LE Conjunctivitis			
71	Rajathi	45 yrs	F		RE Conjunctival swab	RE Conjunctivitis	Staph.aureus	Ak,Van,Do,E,ctr,Of,Chl	Cot,G,Cip
72	Habiba Begum	38 yrs	F		RE Conjunctival swab	RE Conjunctivitis	Staph.aureus	Ak,Do,E,G,Van	Cip,Of,Ctr,Cot,Chl
73	Fathima	55 yrs	F		LE Conjunctival swab	LE Conjunctivitis			
74	Raj	58 yrs	M		LE Conjunctival swab	LE Conjunctivitis			
75	Chellammal	55 yrs	F		RE Conjunctival swab	RE Conjunctivitis			

76	Soudeswari	58 yrs	F		LE Conjunctival swab	LE Conjunctivitis			
77	lakshmanan	32 yrs	M		LE Conjunctival swab	LE Conjunctivitis			
78	Shanmugam	50 yrs	M		RE Conjunctival swab	RE Conjunctivitis	Staph.aureus	Ak,Do,E,G,Van	Cip,Of,Ctr,Cot,Chl
79	Deepa	19 yrs	F		LE Conjunctival swab	LE Conjunctivitis	Staph.aureus	Ak,Ctr,Cip,Van	Ak,Ctr,Cip,Van
80	Sugaina	25 yrs	F		RE Conjunctival swab	RE Conjunctivitis			
81	Devendran	16 yrs	m		RE Conjunctival swab	RE Conjunctivitis			
82	Rajina	13 yrs	F		LE Conjunctival swab	LE Conjunctivitis			
83	Palanisamy	50 yrs	M		RE Conjunctival swab	RE Conjunctivitis	Staph.aureus	Ak,Do,Ctr,Of,Chl	Cot,Van,G,Cip,E
84	Thamburaj	41 yrs	M		RE Conjunctival swab	RE Conjunctivitis	E. coli	Ak,G,Cip,Of,Ctr,cot	Chl
85	Gunasekaran	66 yrs	M		LE Conjunctival swab	LE Conjunctivitis			
86	Palani	80 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
87	Thirumal	64 yrs	F		RE Conjunctival swab	RE Conjunctivitis	Staph.aureus	Ak,Ctr,Cip,Van	Ak,Ctr,Cip,Van
88	Pappammal	75 yrs	F		LE Conjunctival swab	LE Conjunctivitis			
89	B/o Deepa	2 days	Mch		RE Conjunctival swab	RE Conjunctivitis			
90	palani	80 yrs	M		RE Conjunctival swab	RE Conjunctivitis	E. coli	Ak,G	Cip,Of,Ctr,Cot,Chl
91	Amlu	55 yrs	F		LE Conjunctival swab	LE Conjunctivitis	CONS	Ak,G,cip,Do,E,Van,ctr	oF,Chl,Cot
92	Kanniyan	75 yrs	M		RE Conjunctival swab	RE Conjunctivitis			
93	B/oKavitha	2 days	Fch		RE Conjunctival swab	RE Conjunctivitis			
94	Mahalingam	67 yrs	M		LE Conjunctival swab	LE Conjunctivitis	Klebsiella	Ak,G,cip,of,ctr,cot	Chl
95	Kathamuthu	86 yrs	M		RE Conjunctival swab	RE Conjunctivitis	CONS	Ak,G,cip,Do,E,Van,ctr	oF,Chl,Cot
96	Unnamalai	75 yrs	F		LE Conjunctival swab	LE Conjunctivitis			

S.No	Name	Age	Sex	Occupation	Predisp factors	Material	DM/HT/imm	Specimen	KOH	G.S	Fungal	Bacterial
97	Vijaya Kumar	61 yrs	M	Agriculture	Trauma RE	stick		RE Corneal scrapings	+		Fusarium	
98	Bismilla Khan	61 yrs	M	Agriculture	Trauma LE	Hay	DM(+)	LE Corneal scrapings	+	+	Fusarium	
99	Sasikala	12 yrs	F	Student	Trauma RE	Hair		RE Corneal scrapings			Penicillium	
100	Velusamy	60 yrs	M	Labourer	Trauma LE	stick		LE Corneal scrapings	+		Penicillium	
101	Mariappan	30 yrs	m	Labourer	Trauma RE	sand		RE Corneal scrapings				
102	kamaraj	65 yrs	m	Agriculture	Trauma LE	Nail		LE Corneal scrapings	+	+		
103	Ayyammal	85 yrs	F	Agriculture	Trauma LE	Ant bite		LE Corneal scrapings	+	+	Fusarium	
104	Palanisamy	60 yrs	M	Agriculture	Trauma LE	stick		LE Corneal scrapings	+			
105	Thangammal	72 yrs	F	Agriculture	Trauma RE	stick		RE Corneal scrapings				
106	Selvi	40 yrs	F	House wife	Trauma LE	Stick		LE Corneal scrapings	+	+		
107	Kaliyammal	50 yrs	F	Agriculture	Trauma LE	Stick		LE Corneal scrapings	+	+		
108	Palaniammal	70 yrs	F	Agriculture	Trauma lE	stick		LE Corneal scrapings	+	+	Fusarium	
109	Rangasamy	65 yrs	M	Agriculture	Trauma lE	sand		LE Corneal scrapings				
110	Meenakshi	43 yrs	F	Agriculture	Trauma LE	stick		LE Corneal scrapings	+	+	Fusarium	
111	Kumaran	47 yrs	M	Agriculture	Trauma RE	stick		RE Corneal scrapings				
112	Kumar	40 yrs	M	Barber	FB(LE)	sand		LE Corneal scrapings				
113	Sundari	35 yrs	F	Agriculture	Trauma LE	stick		LE Corneal scrapings				
114	Suseela	30 yrs	F	House wife	Contact lens			RE Corneal scrapings				
115	Balakrishnan	66 yrs	M	Agriculture	Trauma LE	Hay	DM(+)	LE Corneal scrapings	+	+		
116	Marathal	77 yrs	F	Agriculture	Trauma LE	stick	DM(+)	LE Corneal scrapings	+	+	Fusarium	
117	Ammasaiyammal	54 yrs	F	Agriculture	Trauma LE	hay		LE Corneal scrapings				
118	Murugesan	50 yrs	M	Agriculture	Trauma LE			LE Corneal scrapings				
119	Thamburaj	41 yrs	M	Carpenter	Trauma RE			RE Corneal scrapings				
120	Nanjunisha	60 yrs	F	Agriculture	Unknown			RE Corneal scrapings				
121	Mangaiyarkarasi	46 yrs	M	Carpenter	Unknown			LE Corneal scrapings				
122	kathamuthu	50 yrs	M	Agriculture	(Post-PRP)			LE Corneal scrapings				
123	Shivaji	66 yrs	M	Agriculture	Corticosteroid			LE Corneal scrapings				
124	Palani	49yrs	M	Agriculture	(Post-PRP)			RE Corneal scrapings	+	+		
125	Moiden	45yrs	M	Carpenter	FB			LE Corneal scrapings				
126	Babu	44 yrs	M	Barber	Corticosteroid			RE Corneal scrapings	+			

S.No	Name	Age	Sex	Occupation	DM/HT	Specimen	Diagnosis	Organism	Sensitive	Resistant
127	Santhamma	50 yrs	F			Pus	LE Lacrimal abscess			
128	Rajammal	60 yrs	F			Pus	RE Dacryocystitis			
129	Ponnammal	65 yrs	F			Pus	LE Dacryocystitis	Staph.aureus	AK,Do,E,Van,Amc	Ctr,G,Cot,Cip,Of
130	Muthumeena	55 yrs	F			Pus	RE Mucocele	Staph.aureus	Ak,Van,Do,Ctr	G,Cip,Of,E,Cot,Amc
131	Sumathi	27 yrs	F			Pus	RE Dacryocystitis	E. coli	Ak,G,Cip,Ctr,	Of,Chl,Amc,Cot
132	Rajammal	50 yrs	F			Pus	RE Mucocele	CONS	AK,G,Cip,of, ,E,Do,ctr,Van,cot,	Amc
133	Parijatham	44 yrs	F			Pus	RE Lacrimal abscess	Staph.aureus	Ak,Van,E,Cot,Amc	G,Cip,Of,Ctr,Do
134	Sumathi	27 yrs	F			Pus	LE Dacryocystitis			
135	Palanisamy	55 yrs	M			Pus	LE Dacryocystitis	Staph.aureus	AK,Do,E,Van,	Ctr,G,Cot,Amc,Cip,Of
136	Sowdasree	58 yrs	F			Pus	RE Mucocele			
137	Palanal	55 yrs	F			Pus	RE Dacryocystitis	Klebsiella	Ak,Cip,Of,	Ctr,G,Cot,Amc,Chl
138	Saraswathy	68 yrs	F			Pus	RE Dacryocystitis	Staph.aureus	AK,E,Ctr,Van,Cip,Of	G,Do,Cot,Amc
139	Santhamma	60 yrs	F			Pus	LE Lacrimal abscess	E. coli	Ak,Ctr	G,Cot,Cip,Of,Amc
140	Maruthan	58 yrs	M			Pus	LE Dacryocystitis			
141	Mani	55 yrs	M			Pus	RE Dacryocystitis	E. coli	Ak,Ctr	G,Cot,Cip,Of,Amc
142	Gopalraj	59 yrs	M			Pus	RE Lacrimal abscess	CONS	Van,Chl,Cip	Ak,G,Ctr,Do,E,Cot,Amc
143	Karuppal	58 yrs	F			Pus	RE Lacrimal abscess			
144	Sarojini	65 yrs	F			Pus	LE Mucocele			
145	Chellamuthu	65 yrs	M			Pus	RE Mucocele	Staph.aureus	Ak,Cip,Cot,Van,G	Ctr,Of,E,Amc,Do
146	Thangavel	57 yrs	M			Pus	RE Lacrimal abscess			
147	Janaki	65 yrs	F			Pus	LE Lacrimal abscess			
148	Vellingiri	51 yrs	M			Pus	LE Mucocele	Staph.aureus	Ak,Van,Ctr,Amc	Cip,Of,Cot,Do,E,G
149	Karupaiya	67 yrs	M			Pus	Re Mucocele			
150	Leela	61 yrs	F			Pus	RE Lacrimal abscess			
151	Ashwin	3 yrs	Meh			Pus	LE Dacryocystitis	Staph.aureus	Ak	Van,G,Cip,Of,Do,E,Ctr ,Amc,Cot
152	Pappathy	65 yrs	F			Pus	RE Dacryocystitis	Staph.aureus	Ctr,Do,E,Cot	AK,G,Van,Cip,Of,Chl
153	Sumathi	27 yrs	F			Pus	RE Dacryocystitis			
154	Palanisamy	53 yrs	M			Pus	LE Dacryocystitis	Staph.aureus	Ak	Van,G,Cip,Of,Do,E,Ctr ,Amc,Cot
155	Gomathi	70 yrs	F			Pus	RE Dacryocystitis	CONS	Cip,Do,Van,E,Amc,AK,G	Of,Cot,Chl
156	Santhana mary	80 yrs	F			Pus	RE Dacryocystitis			
157	Arumugham	66 yrs	M			Pus	LE Dacryocystitis			
158	Govindammal	60 yrs	F			Pus	LE Dacryocystitis			
159	Ganesan	33 yrs	M			Pus	LE Dacryocystitis			

S.No	Name	Age	Sex	Occup	HT/DM/Imm	Specimen	Diagnosis	Organism	Sensitive	Resistant
160	Samia	28 yrs	F			Pus	LE Lacrimal abscess	Staph aureus	Ak,Do,E,Van	Ctr,G,Cot,Amc,Cip,Of
161	Maruthamuthu	37 yrs	M			Pus	RE Dacryocystitis			
162	Satheesh Kumar	13 yrs	M			Pus	LE Dacryocystitis			
163	Gokulraj	14 yrs	M			Pus	RE Mucocele			
164	Shanthi	22 yrs	F			Pus	RE Dacryocystitis			
165	Abdul Majith	72 yrs	M			Pus	RE Mucocele			
166	Gayathri	24 yrs	F			Pus	RE Lacrimal abscess	CONS	Ak,Do,E,Van	Ctr,G,Cot,Amc,Cip,Of
167	Chandran	46 yrs	M			Pus	LE Dacryocystitis			
168	Sindhu	15 yrs	F			Pus	LE Dacryocystitis	CONS	Ak,Chl,Cot	G,Ctr,Cip,Of,Do,E,Van
169	Ajith	18 yrs	M			Pus	RE Mucocele	CONS	Van	Ak,G,Cip,Of,Do,E,Ctr
170	Deepa	19 yrs	F			Pus	RE Dacryocystitis	CONS	Ak,G,Van	Ctr,Cip,Of,Do,E
171	Maheswari	40 yrs	F			Pus	RE Dacryocystitis	E .coli	Ak,Chl	G,Ctr,Cip,Of,Cot,Amc
172	Mohammed Ra	45 yrs	M			Pus	LE Lacrimal abscess	CONS	Ak,G,Cip,Of,Do	E,Van,Chl,Cot
173	Chellamuthu	65 yrs	M			Pus	LE Dacryocystitis	Klebsiella	Ak,Cip,Of	G,Ctr,Cot,Amc
174	Rajima	13 yrs	F			Pus	RE Dacryocystitis			
175	Gowri	45 yrs	F			Pus	LE Dacryocystitis			
176	Eswari	47 yrs	F			Pus	LE Dacryocystitis			
177	Marathal	70 yrs	F			Pus	RE Mucocele	CONS	Ak,Ctr,Do,E,Lz,Van	G,Cip,Of
178	Kameswari	47 ys	F			Pus	RE Dacryocystitis			
179	Aathi	13 yrs	M			Pus	RE Dacryocystitis			
180	Ravindran	35 yrs	m			Pus	LE.LL.H.Internum	CONS	Ak,G,Van	Ctr,Cip,Of,Do,E
181	Arun	17 yrs	M			Pus	LE.LL. Chalazion	Staph.aureus	Ak,G,Cip,Of,Do	Van,Ctr,E,Cot,Chl
182	Aruchamy	33 yrs	m			Pus	RT.UL Chalazion	CONS	Ak,G,Van	Ctr,Cip,Of,Do,E
183	Jayachan	27 yrs	M			Pus	RE.UL.H. externum	Staph.aureus	Ak,G,Cip,Of,Do	Van,Ctr,E,Cot,Chl
184	kali	65 yrs	F			Pus	RE.UL.H.Externum			
185	Sundaramal	65 yrs	F			Pus	RE.LL. Chalazion	CONS	Ak,G,Van	Ctr,Cip,Of,Do,E
186	Sakthivel	38 yrs	M			Pus	RE.UL Chalazion	CONS	Ak,Do,E,Ctr	G,Cip,Of,Van
187	Selvaraj	44 yrs	m			Pus	RE.UL Chalazion	Staph.aureus	Ak,G,Ctr,Do,E,Van,L	Cip,Of
188	Sundarajan	85 yrs	F			Pus	LE.LL.H.Externum			
189	Ayyamal	51 yrs	F			Pus	LE.LL.H.Internum			
190	Saroja	59 yrs	F			Pus	RE.UL Chalazion	Staph.aureus	Ak,G,Ctr,Do,E,Van,L	Cip,Of

191	Chellammal	80 yrs	F			Pus	LE.LL. Chalazion			
192	Nagaraj	43 yrs	M			Pus	LE.LL Chalazion			
193	Muthammal	48 yrs	F			Pus	LE.UL Chalazion			
194	Valliammal	60 yrs	F			Pus	RE.UL Chalazion	Staph aureus	Do,E,Van,Ctr	Ak,G,Cip,Of
195	Ramasamy	63 yrs	M			Pus	RE.LL. Chalazion			
196	Muji Kunisha	55 yrs	F			Pus	RE. UL.H externum	Staph aureus	Do,E,Van,Ctr	Ak,G,Cip,Of
197	Sivaram	28 yrs	M			Pus	RE.LL. Chalazion	CONS	Ak,G,Cip,Of,Do,E,Ctr	Van,Ctr,E,Cot,Chl
198	Ashok	5 yrs	Mch			Pus	RE.UL. Chalazion			
199	Lakshmi	55 yrs	F			Pus	LE.LL Chalazion	Staph aureus	Do,E,Van,Ctr	Ak,G,Cip,Of
200	Vellingiri	58 yrs	M			Pus	LE.LL.H.Externum			
201	Angel	8 yrs	Fch			Pus	LE.UL.H. Internum			
202	Chandra	54 yrs	F			Pus	RE.LL. Chalazion	CONS	Ak,Cip,Of,Ctr,G	Cot,Amc
203	Sakuntala	55 yrs	F			Pus	RE.UL.Chalazion			
204	Pushpa	67 yrs	F			Pus	LE.LL. Chalazion	CONS	Ak,Ctr,Do,E,Van	Cip,Of,G
205	Chandran	54 yrs	F			Pus	RE.LL. Chalazion			
206	Sarojini	65 yrs	F			Pus	RE.UL. Chalazion	CONS	Ak,G,Of	Cip,Ctr,Cot,Amc
207	Sharadha	72 yrs	F			Pus	RE.LL.H. Externum			
208	Mayilammal	75 yrs	F			Pus	LE.LL. Chalazion			
209	Lakshmi	65 yrs	F			Pus	LE.LL. Chalazion	CONS	Ak,Ctr,Do,E,Van	Cip,Of,G
210	Kaliammal	80 yrs	F			Pus	LE.LL.H. Externum			
211	Palanisamy	65 yrs	m			Pus	RE.UL.H. externum	CONS	Ak,G,Of	Cip,Ctr,Cot,Amc
212	Ranganathan	35 yrs	M			Pus	LE H. Externum			
213	Ampan	21 yrs	M			Pus	LE.LL. Chalazion			
214	Mohammed Rijv	25 yrs	m			Pus	RE.LL. Chalazion		Ak,Cip,Ctr,Do,E,	G,Of
215	Kavitha	21 yrs	F			Pus	RE.UL. Chalazion			
216	Harish Kumar	11 yrs	Mch			Pus	LE.LL. Chalazion	CONS	Ak,G,Of	Cip,Ctr,Cot,Amc
217	Muthupandi	40yrs	M			vitreous	LE Endophthalmitis			
218	Sabiya Begum	60yrs	F			vitreous	LE Endophthalmitis			
219	Palanisamy	47yrs	M				LE Endophthalmitis			
220	Palanisamy	47yrs	M				LE Endophthalmitis			
221	Raniyammal	50yrs	F			vitreous	LE Endophthalmitis			
222	Thangaraj	18yrs	M			vitreous	LE Endophthalmitis			

ABBREVIATIONS IN MASTER CHART

Ak	- Amikacin
G	- Gentamycin
Cip	- Ciprofloxacin
Of	- Ofloxacin
Cot	- Cotrimoxazole
Chl	- Chloramphenicol
Do	- Doxycycline
E	- Erythromycin
Van	- Vancomycin
Ctr	- Ceftriaxone
Amc	- Amoxyclavulanic acid
M	- Male
F	- Female
Mch	- Male child
Fch	- Female child
RE	- Right Eye
LE	- Left Eye
UL	- Upper Lid
LL	- Lower lid
DM /HT	- Diabetes Mellitus/ Hypertension